SCIENTIFIC AMERICAN

A WEEKLY JOURNAL OF PRACTICAL INFORMATION, ART, SCIENCE, MECHANICS, CHEMISTRY, AND MANUFACTURES.

Vol. XXVIII.—No. 8. [NEW SERIES.] NEW YORK, FEBRUARY 22, 1873. [$3 per Annum, IN ADVANCE.

THE SNAP FLASK.

We are not aware to whom is due the credit of the invention of the useful contrivance which our artist has so graphically depicted in the hands of the brawny workman in the engraving. It is simple, handy, as we shall presently show, and, withal, a convenience which iron founders, or more especially molders in green sand, can ill afford to be without We have therefore prepared the accompanying illustration, and to make matters more clear, we add a few words of description, in the hope that the suggestion may prove of practical value to those who are unacquainted with its uses, construction, and merits.

The snap flask, as it is commonly termed, differs from an ordinary two part flask in having its portions hinged together by a butt at one corner and closed by a latch at the corner diagonally opposite. It is without those troublesome cross pieces which are always half charred, generally of the wrong shape and in the wrong place, nor are its various parts filled with numberless bristling rusty nails. Its interior sides, being smoothly scooped out, hold the firmly rammed sand during the removal of the cope. In constructing small moldings, the flask is best located on a rude table, so that in using his two wooden hand rammers (such as are represented in the cut) to pack the sand home, the molder can stand erect. After the work is finished in the ordinary way, it only remains to unlatch the corner and swing the flask when it is ready for immediate re-use. The sand mold is removed from the table to the floor and weighted with a plate of cast iron, made with lifting ears on two sides and pierced with a square aperture in the center, through which the molten metal is poured.

MOLDING WITH THE SNAP FLASK.

We think there are few workmen who will not agree with us in the opinion that, after a hard day's work, it is no slight labor to shake out, fit together, and pile up in the yard a score or more of small flasks, and that any contrivance which, like that above described, will save them such toil is well worthy of their attention and employment.

Practical Notes on the Steam Engine.

The comparison of the different systems of construction of steam engines, old and new, says *Dingler's Polytechnisches Journal*, with reference to the speed of the piston, steam pressure, duration of admission of steam to the cylinder, and the regular and even motion of the machine, shows that the rapidity of the piston and the pressure of steam augments with the duration of expansion. The following classification then may be established: 1st. Low pressure engines which work with but a feeble or low tension of steam (35 to 40 pounds per square inch) with a small speed of piston and without or nearly without expansion: under these conditions the motion is regular but the expenses of setting up and keeping in repair are large. This system is represented by Watts old beam engine. 2. Engines which work quicker than the preceding, but still with a moderate speed, the steam pressure and expansion remaining as above. Motion irregular. Expense of establishing light, but of repairs, heavy. To this category belong what are termed good ordinary machines. 3. Engines of which the pistons move moderately quickly, of which the steam works at a medium pressure and in which steam is admitted to the cylinder during half or three quarters the stroke. These have a sufficiently regular motion and their cost of establishment and repair is relatively low They are usually constructed with a single horizontal cylinder and are in very extended use. 4. Engines which work with the same rapidity and pressure as to the preceding system but with large expansion, very usually provided with a specially devised cylinder. Motion irregular. More expensive than the engines in the preceding paragraph. To this category belong the Woolf compound engines, which have two cylinders placed side by side, in a horizontal position but not on the same plane.

With these four classes of machines, the above results have been determined and confirmed by long experience. One more system remains to be noticed: 5. The engines which work with high velocity, high pressure and great expansion. These are regular in motion and low in first cost and expense of repairs. But little experience has been had with these machines. It is considered, however, that they possess a decided advantage in having speed together with a horizontal position. They may be advantageously substituted for the old forms of cumbrous and slow beam engines.

Absorption of Light by Photo Film.

Professor J. W. Draper says: The silver compounds of collodion absorb the radiations falling on them, which are capable of producing a photographic effect. Yet sensitive as it is, collodion is very far from having its maximum sensitiveness, as is shown by the following experiment, which is of no small interest to photographers: I took five dry collodion plates, prepared by what is known as the tannin process; and having made a pile of them, I caused the rays of a gas flame to pass through them all at the same time, On developing, it was found that the first plate was strongly impressed, and the second, which had been behind it, apparently quite as much. Even the fifth was considerably stained. From this it follows that the collodion film, as ordinarily used, absorbs only a fractional part of the rays that can affect it. Could it be made to absorb the whole, its sensitiveness would be correspondingly increased.

Sounds of the Body.

At a recent meeting of the Clinical Society of London, Dr. Poore exhibited an adaptation of a well known philosophical experiment to medical purposes. A patient with a remarkably loud aortic regurgitant murmur, accompanied by intense thrill, was made to lie on his back upon a common mahogany table. Dr. Poore then took an ordinary walking stick, placing it vertically upon the sternum at the level of the third costal cartilages, and upon the upper end he poised the sounding board of a guitar, with the orifice downwards, When this arrangement was completed, and after complete silence had been obtained, the murmur became distinctly audible to the bystanders. Dr. Poore remarked that he regarded the case merely as a clinical curiosity. His apparatus was very rough, but it served to exhibit a novel application of acoustic principles, and probably, with a specially constructed and more delicate instrument, it would be possible to render the sounds and murmurs of the heart audible for the purposes of clinical demonstration. Sounds and probes with sounding boards at one end were used in some of the clinical lecture theaters in Germany; and Dr. Poore exhibited an iron probe with a circular sounding board at its extremity, by means of which all vibrations communicated to the probe were greatly intensified.

Mr. De Morgan remarked that Dr. Corfe had suggested the converse of this. He demonstrated that, when a person placed his head on the chest, the sound of his voice, when speaking, was affected by the condition of the patient's chest.

Dr. Anstie remarked that Mr. Brooke used to demonstrate stone in the bladder to his class at the Westminster Hospital by means of a sounding board attached to the staff.

The application of this well known phenomenon of the transmission of sound to the diagnosis of chest diseases may possibly lead to a material improvement upon the stethoscope. A walking stick is, of course, not the most suitable connecting rod for conducting the sound.

TOMATOES IN IRON POTS.—There are a thousand and one things I would like to know (and probably shall, in time, unless I have to learn how to vote); but this I do know, that tomatoes must not be cooked in an iron pot. Some beneficent housekeeper, following in the footsteps of the illustrious "scrapple" maker, gives a recipe in last week's *Rural* for a cheap soup, in which she directs the ingredients to be put in an iron pot. I sometimes, at good tables, taste tomatoes which have been made bitter by this process. If the intention is to medicate them, the result will satisfy the design.—*Rural Yorker.* [It might be added that vegetables should never be cooked in iron pots, unless the latter are enameled or otherwise coated internally.]

Scientific American.

MUNN & CO., Editors and Proprietors.

PUBLISHED WEEKLY AT
NO. 37 PARK ROW, NEW YORK.

O. D. MUNN. A. E. BEACH.

TERMS.

One copy, one year	$3 00
One copy, six months	1 50
CLUB RATES { Ten copies, one year, each $2 50	25 00
CLUB RATES { Over ten copies, same rate, each	2 50

VOL. XXVIII., No. 8. [NEW SERIES.] *Twenty-eighth Year.*

NEW YORK, SATURDAY, FEBRUARY 22, 1873.

Contents:

(Illustrated articles are marked with an asterisk.)

ANNUAL REPORT OF THE COMMISSIONER OF PATENTS.

The annual report of the Commissioner of Patents to Congress, for 1872, has just been sent in, from which it appears that the affairs of the Patent Office are in good order and flourishing condition. 3,090 caveats were filed last year, being a slight decrease over the previous year. 18,246 applications for patents were made, of which 13,590 were granted. A slight increase in the number of patents granted is shown, and a considerable decrease in the number of applications made, which the Commissioner explains in a curious way. The decrease of applications and increase of the number of patents granted, is due, he says, to the circulation of the office publications, giving to inventors, manufacturers, and attorneys reliable information as to what inventions are already patented, thereby securing better applications but fewer in number.

Now, if this is so, if the effect of the office publications has been thus quickly and noticeably, during the first year, to reduce the number of applications, and yet to increase the number of patents granted, may we not expect similar results, in greater ratio, a few years hence, when the aforesaid publications are more extensively circulated? Let us look at the results for the next five years, allowing that the ratio remains only the same:—Number of applications made in 1871, 19,472; in 1872, 18,246; decrease, 1,226. Number of patents granted in 1871, 13,033; number granted in 1872, 13,590; increase, 557.—Allowing the same ratio each year for the next five years, we should have the following results for the year 1878:—Number of applications made, 12,160, and number of applications granted, 16,375. Evidently it will not do to carry forward the Commissioner's deductions.

A much more probable explanation for the discrepancies in the figures for 1871 and 1872 would be this:

In 1871 the Office was overcrowded with business and delays ensued, and the examiners doubtless rejected many cases for the first time which, on revision in 1872, they decided to allow. The falling off of 1,226 applications in 1872 is probably due to the discouraging effects upon inventors of the official delays during the year preceding.

The Commissioner informs us that the expenses of the Patent Office have been increased during 1872; but we are satisfied that the money has been well spent in providing room, and in reproducing copies of back patents.

The various official publications of diagrams, claims, bound volumes of reduced copies, and full size copies of patents have been admirably produced, and reflect the highest credit upon the Commissioner. This department of publication has become one of the most important branches of labor at the Patent Office, and is of inestimable value to the country. The publication of a general Index to the patents, and a Digest of the inventions, are highly important works which ought to be proceeded with, and we hope that Congress will give to the Commissioner the necessary authority. The Commissioner recommends that a law to authorize the extension of patents granted subsequent to 1861 should be enacted. We trust it may be.

In urging Congress to adopt his scheme for the "reorganization" of the Patent Office, the Commissioner makes the following statement:—"After careful and extended enquiry, I am convinced that considerably more than one half of the capital employed in manufacturing in the United States is thus invested because of the security to specialities obtained from patents." "*For this reason*," he says, "the demand for better examinations and more care as to the wording of specifications and claims before issuing patents or rejecting applications, is increasing every day. The business of the Office is being done under a plan of organization adopted *in its infancy*—a plan adequate to its wants at that time, but which has been outgrown by its enormous increase of business." The italics are ours.

The Commissioner's plan for "reorganization" is simply to place a set of nine bosses over the present examiners, to be called "chiefs of division," who are to supervise the work of the examiners and decide whether their decisions are to stand, and whether a patent shall be granted or refused. We deprecate the addition of any new forms and ceremonies, with their attendant delays, red tapeism and expenses, to the business of obtaining patents. We prefer the *infantile* system as it now exists, which works so well, gives such general satisfaction, and affords such ample securities that, according to the Commissioner's own showing, it now employs *one half of all the capital invested in manufacturing* in the United States.

It is a good old adage: "Let well enough alone." It would be hard to find a system that works better than the present, and we say, *let it alone*. The simpler the forms and the more prompt the official action in the grant of patents, the more will the inventive genius of the country be fostered and encouraged.

A BLOW TO THE TRADES' UNIONS.

The last volume of the Massachusetts Law Reports contains the ruling of Chief Justice Chapman, in a case which involves the question of whether trade organizations have any right to exact fines, or use other means of extortion to compel employers to accede to their demands. The plaintiff, Mr. John Carew, had contracted to supply a certain quantity of hewn stone; certain members of a society called the Journeyman Freestone Cutters' Association of Boston obtained from him the sum, or fine, as they called it, of $500, by threatening to deprive him of laborers necessary to him for the fulfilment of his contract, and by actually inducing some of his employees to leave. The action was brought to recover. The court ruled that the plaintiff might regain not only $500 but any damage to his business caused by the acts of the conspirators. Chief Justice Chapman says, in his opinion: "The acts alleged and proved in this case are peculiarly offensive to the principles which prevail in this country; and if such practices could enjoy impunity, they would tend to establish a tyranny of irresponsible persons over labor and mechanical business which would be extremely injurious to both."

There is not an employer or a right minded workman in the country who will not rejoice at the placing upon record of so clear, resolute and unequivocal a condemnation of the whole system of trades' unionism as it is now practiced. One or two such decisions in this State are greatly needed, and would do more to prevent such uprisings as that of last summer than years of discussion between the contending parties. We have plenty of laws on our statute books militating against conspiracy; and, if none of them cover such cases as that above cited, let some of the employers who suffered by the great strike see that the proper steps be taken to have suitable enactments framed by the Legislature, that will effectually remedy all existing evils.

THE VIENNA EXPOSITION.

The buildings of the Vienna Exposition are now completed and in readiness for the reception of the articles to be exhibited. Several changes have, we learn, been made in the general plan. The center space of the Palace of Industry, instead of being divided up, has been converted into one colossal rotunda, the largest roofed building in existence, measuring 426½ feet in diameter and 300 feet in hight. The iron work of the roof weighs 40,000 tuns, and it may be imagined that it required no small effort of engineering skill to raise this enormous load to a hight of nearly 300 feet. The work was accomplished by 240 men in three months. The central structure is iron, covered with an outer coating of masonry connected with the interior by girders. Some idea of the dimensions of the vast fabric may be gained from the fact that a regiment of infantry numbering 1,400 men could conveniently be paraded on the architectural cornice which runs round the inside where the roof joins the columns.

The materials of which the buildings are composed are mainly iron, wood and glass, but the walls, where not clearstoried, are filled in with brick. The outward decorations, which are very imposing and of a solidity apparently sufficient to last for ages, are made of canvas steeped in fluid plaster of Paris and hardened in molds. With admirable taste, a blue texture of jute spangled with golden ornaments has been selected as a wall covering, which contrasts agreeably with the dark red of the supporting columns.

The machinery hall is a simple brick building with no pretension to architectural display. The motive powers, cranes, boilers and engines are all themselves exhibits. All engines under seventy-five horse power and cranes lifting less than twelve tuns are excluded. Borsig's engine factory in Berlin, which turned out its two thousandth locomotive for the Paris Exposition, in 1867, will exhibit its three thousandth in Vienna.

The supplementary structures will consist of edifices for the accommodation of distinguished visitors, and annexes to hold the excess of exhibits not finding room in the great galleries. The Austrian Emperor is to have a magnificently fitted up pavilion, and it is stated that the French and German buildings will vie with it in grandeur. Krupp, of cast steel renown, will stock a special edifice with his own inventions, and the *New Free Press* boldly aspires to out-do the London *Times*, whose machinery was last year exhibited in London, by erecting a pavilion of its own. One space of 1,600 square meters is appointed to hold German educational apparatus and appliances.

Danger from fire is put almost beyond the reach of possibility. There is a large basin of water in the grounds, filled conveniently from the adjoining Danube, which might at any moment convert the whole area into a lake. The basin was constructed at a cost of $12,000, and in addition thereto, fire engines and hydrants are provided in sufficient numbers to inundate every gallery in the buildings.

THE SCIENCE RECORD FOR 1873.

In reply to various enquiries we would state that Science Record for 1873 is now almost through the press and will be issued either next week or the week after, when all to whom copies are due will be immediately supplied. A large edition has been ordered. It is a handsome octavo volume of six hundred pages, illustrated with many engravings. The Engineering department contains views of several of the most important railway bridges in this country, the great Suspension Bridge between New York and Brooklyn, Steam Street Cars, improvements in engines, injectors, mills, and machinery of all descriptions.

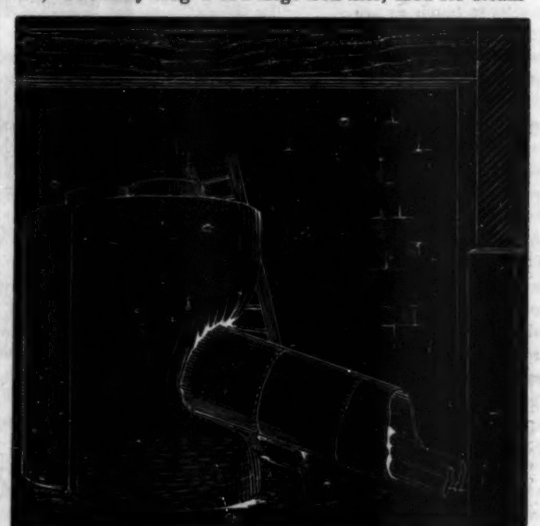
The department of Geography contains illustrations from the Yellowstone region, showing the wonderful pools, hot springs and other extraordinary formations, which are among the wonders of the world.

The department of Biography is rich in portraiture, containing steel and wood engravings of distinguished men of science, including Professor Joseph Henry, Professor Tyndall, Professor Dana, Professor Peirce, Professor Bunsen, Professor Kirchhoff and Professor Morse. The portrait of the latter is engraved from a painting from life taken some years ago, soon after Professor Morse had completed the first line of telegraph, between Baltimore and Washington, when he was in the vigor of his life.

The book is one of interest and value for lovers of progressive, practical science. The advertisement on another page shows the general scope of the contents.

THREE FEARFUL BOILER EXPLOSIONS IN ONE DAY.

Three terrible boiler explosions have recently occurred on the same day, February 3d, one resulting in the death of nineteen persons and the wounding of nearly two score more. One of these explosions took place at Pittsburgh, Pa., another at Syracuse, N. Y., and the third near Norristown, Pa. To an esteemed correspondent, Mr. W. B. Le Van, of Philadelphia, we are indebted for the accompanying diagrams and details of the casualty at the rolling mill of Messrs. J. Wood & Bro. at Conshohocken, near Norristown, Pa., which destroyed about one half of the establishment. The exploded boiler was 18 feet long and 4½ feet in diameter, and had been in constant use in the mill for twenty years. It had two flues, each 18 inches in diameter, which, with the shell, were originally of No. 4 iron, calculated to withstand 80 pounds working pressure to the square inch. At the ruptured point, the iron had become but three sixteenths of an inch in thickness, and was besides much crystalized. When the explosion took place a portion of the boiler was hurled, end first, across a canal and a railway track into a building known as the Albion Print Works. There it encountered a girder of an arched doorway, shattered it (with the adjacent wall) and finally lodged in a large iron kier, used for steaming pieces of muslin, in the manner shown in our diagram.



Two boys were engaged within the kier, distributing the warp for bleaching, both of whom were instantly killed. The kier was 8 feet wide and 12 feet high.

Ten minutes before the accident the steam gage showed a pressure of 53 pounds. The close flattening together of the flues indicates that they collapsed from force externally applied. There is little doubt as to the cause of the disaster. The boiler was simply used up, and the thinness of the iron and the clean, smooth rupture show that it had become inadequate to withstand the required pressure. Eleven persons were killed outright and a similar number, more or less, badly wounded. The responsibility of this awful disaster appears to rest upon the proprietors, and forms another link in the long chain of similar horrors due to a negligence of reasonable precautions for the safety of human life.

The Pittsburgh explosion occurred in the extensive American Iron Works of Messrs. Jones & Laughlins. These works are among the largest in the country, covering fifteen acres of ground and employing three thousand workmen. It is here that the celebrated cold rolled shafting is made. The explosion involved a battery of four boilers located in the central part of the numerous workshops. The spike and nail

factories together with the sheet mill were demolished, at a loss of some $75,000 and seven persons killed and thirty wounded. The boilers had been five years in use. It is stated that the iron was good and that the gages showed plenty of water just before the accident. Portions of metal were thrown for distances of three blocks, crashing through the roofs of neighboring buildings.

Among the incidents of the disaster, it is mentioned that Mrs. Clarke, wife of one of the employees, hearing the noise of the explosion, fell upon her knees and commenced to pray; while in the attitude of supplication, a piece of the boiler weighing 700 pounds struck the house, and went crushing through the room on the line where her head would have been had she remained standing. Another mass of the boiler iron, weighing nearly eighty pounds, went lumbering through the air for a distance of 200 yards, and, descending upon a door of a bakery on Carson Street, crashed through it as it might through a house of straw, and fell upon the middle of the floor. Fortunately, however, though much destruction of property was occasioned, no loss of life here ensued. A blacksmith, named Jacob Broonsinger, who was working in a shop in the vicinity of the explosion, had been standing at a certain place fixing a horseshoe. He stepped over where the horse was, and had just begun to put the shoe on when an immense piece of iron, weighing fully 200 pounds, came crashing through the roof, and fell on the spot where he had been standing a moment before.

We trust that some of our engineering correspondents will send us diagrams and particulars of these boilers for publication.

The third explosion to which we have alluded took place at Geddes' rolling mill, in Syracuse, N. Y. In the latter case, one workman was killed and seven injured. The boiler was new and considered in prime condition. The buildings and machinery were damaged to the extent of $5,000.

MATTHEW F. MAURY.

Matthew Fontaine Maury, formerly an officer in the United States Navy, afterwards of the Confederate Navy, died recently at his residence at Lexington, Virginia, aged 67. He was formerly superintendent of the Government Hydrographic Office, where he elaborated investigations in regard to winds and ocean currents. The discovery of the telegraphic ocean plateau and the indication of good whaling ground is attributed to him. At the time of his death, he was Professor of Physics in the Virginia Military Institute.

AN OLD FRIEND GONE.

The London *Mechanics' Magazine*, after an existence of fifty years, has, as a distinctive publication, disappeared from public view. It has recently been incorporated with a new weekly periodical, of more pretentious form and larger dimensions, entitled IRON, THE JOURNAL OF SCIENCE, METALS AND MANUFACTURES.

We shall greatly miss the familiar face and the regular visits of our excellent cotemporary, which flourished for nearly a generation before the SCIENTIFIC AMERICAN was conceived. The assurances that the new comer, which is to stand in its place, will be more sprightly and occupy a wider field have, for us, no comfort. For over twenty-five years the *Mechanics' Magazine* has been to us a valued friend and counselor in things scientific, and we deeply regret the exigencies that have compelled its final suspension.

We have before us, as we write, the first number of the *Mechanics' Magazine*, which is graced by a prospectus commencing as follows:

"FELLOW COUNTRYMEN:—Almost every class of people in this enlightened country has now a journal or magazine, which attends to its peculiar interests," etc. It then goes on to say that no publication has yet appeared suited for mechanics and artisans. "But the publishers now undertake such a work under the title of the MECHANICS' MAGAZINE, which shall be so cheap that all may buy, and of such value that no one ought to be without it." The price was fixed at 3d. per copy. It was printed in book form, sixteen pages in each issue, and published weekly. The first number was issued on Saturday, August 30, 1823. How vast has been the progress of science and invention since that day!

The front page of the first number of our venerable cotemporary was adorned by a portrait of James Watt, who had then been buried four years. An excellent biographical sketch of the great inventor then follows. The diving bell is next described and illustrated. Then comes a picture of a man flying in the air, with mechanical wings. A list of the new patents granted during the preceding month is then given, six in number, one of which was issued to Steven Fairbanks, of the United States of America, for certain improvements in locks. How to boil potatoes, and choose a carpet, are explained; also an old wife's notions about tea and teapots. How to detect cotton mixed with wool; How to avoid the effects of foul air in wells, and How a philosopher was outwitted, are explained. The latter states that a little girl came to a learned doctor who was busy in his study, and asked for some fire. [This was before the day of matches.] She had nothing wherewith to carry the coals, and the doctor started to fetch something for that purpose. But the little girl, stooping down, scooped some ashes on one hand and placed thereon with the other some live embers and departed. The astonished doctor threw down his books, saying: "with all my learning I should never have found out that expedient."

Jacob Perkins, the American inventor, was at that time in London, and some of his inventions attracted great attention. Among others noticed in an early number of the *Mechanics' Magazine* was a steam engine and generator, worked at what was then considered an enormous, a fearful pressure, namely, 75 pounds to the inch. His assertions that such engines could be safely worked, and with greater economy, were scarcely credited by the scientific people, notwithstanding that he had a ten horse power engine in actual operation.

The successful removal of a brick house to a considerable distance back from the street, in Maiden Lane, forms the subject of a letter from New York. The job was done by a Mr. Brown by means of screws, and his mechanical genius is highly praised.

Brunel's device for tunneling under the Thames is also illustrated and described. and notice is made of the fact that Sir Humphrey Davy had just discovered the application to mechanism of a certain gas, fifteen times heavier than air, which will produce a power fully equal to that of steam. The great obstacle to the immediate use and introduction of the gas is stated to be the difficulty of confining it. But Sir Humphrey expected to be able to overcome the obstacle.

In the number for January 3, 1823, a correspondent, who is so far in advance of the age that he does not venture to give his name, but signs himself T. G., gives drawings and descriptions of a locomotive engine, cars and railway. His article is entitled "Proposition for a General Iron Railway, with Steam Engines, to Supersede the Necessity of Horses in all Public Vehicles." He says:—"The intention of the present scheme is to introduce a more economical and expeditious mode of conveyance than is now in use, for vehicles of every kind, whether employed in the transport of persons or merchandise. It is proposed to supersede entirely the necessity of horse power in all public wagons, stage and mail coaches, post chaises, etc., and to employ in its stead the more potent agency of steam. A careful examination of the drawings now presented to the public, as a plan of a general iron railway, will, it is hoped, clearly demonstrate the ease, safety, and celerity with which vehicles of every denomination, for the conveyance of goods and persons, may be propelled by mechanic power. The six parallel railways which extend the whole length of our inner plate, form a general iron railway, which might run in a direct line from London to Edinburgh, and from London to Falmouth." This proposed railway had three tracks with devices for the lateral transfer of the cars from one track to the other. Each rail was provided with cogs, set below the face of the rail, and cogged wheels on the locomotive were made to mesh with the rail cogs; the engine and train were thus propelled. It had not then been ascertained that the adhesion of the wheels on the smooth faces of the rails would be sufficient, without the use of cog teeth.

DEPARTURE OF PROFESSOR TYNDALL.

We have before us Professor Tyndall's parting words to his many friends in the United States, delivered at a dinner recently given in his honor by many prominent citizens of New York. Through all the lightness characteristic of a post-prandial speech, we recognize the same earnest efforts in behalf of original research, the same powerful appeal to all classes of educated men to aid in the cultivation of science, that were so eloquently maintained in the able discourses now familiar to us all.

It is difficult to take exception to arguments emanating from so distinguished a source, but, while concurring in the belief that men who are willing to devote their lives to the advancement of our scientific knowledge should be supported, free from other cares, we do not fully acquiesce in the opinion that original research would be very materially forwarded by the establishment of an institute on the same basis as the Royal Institution of Great Britain. Records of the past point to the fact that successful discoverers in the great field of science have toiled, not with costly accessories or assisted by abundant means, but have carried out their labors after struggling against the most adverse of circumstances and with the humblest aids.

We are led to infer from the remarks of the learned author that he regards with a shadow of dissatisfaction the position he has taken upon the lyceum stage. He says "look jealously upon the man who is fond of wandering from his true vocation to appear on public platforms. Now and then the discoverer, when he has anything important to tell, may appear with benefit to himself and the world, but as a general rule he must leave the work of public lecturing to others. If our premise be correct, Professor Tyndall, with characteristic modesty, underrates the magnitude of the service he has rendered to science by his public lectures. Great as he is as an investigator, and valuable as the discoveries attained through his instrumentality are, we consider that as a teacher, as an apostle of science sent to awaken a new interest in its truths in the minds of others, he fulfils his true mission; and that, had he secluded himself as he suggests the inquirer into Nature should do, the value of his contributions to our knowledge published by other means would fall far short of the benefits he has already conferred by his matchless elucidation of truths already known.

Did our space permit, we should be glad to present the whole of Professor Tyndall's admirable speech. As it is, we cannot refrain from quoting the following lines, addressed to those who apply themselves to science as a vocation. After alluding to his mode of life and study in Germany, he says:

'For a good portion of the time I rose an hour and a half earlier, working by lamplight at the differential calculus when the world was slumbering round me. And I risked this breach in my pursuits and this expenditure of time and money, not because I had any definite prospect of material profit in view, but because I thought the cultivation of the intellect important—because, moreover, I loved my work, and entertained the sure and certain hope that, armed with knowledge, one can successfully fight one's way through the world. It is with the view of giving others the chance that I then enjoyed that I propose to devote the surplus of the money which you have so generously poured in upon me, to the education of young philosophers in Germany. I ought not, for their sake, to omit one additional motive by which I was upheld at the time here referred to—that was a sense of duty. Every young man of high aims must, I think, have a spice of this principle within him. There are sure to be hours in his life when his outlook will be dark, his work difficult, and his intellectual future uncertain. Over such periods, when the stimulus of success is absent, he must be carried by his sense of duty. It may not be so quick an incentive as glory, but it is a nobler one, and gives a tone to character which glory cannot impart. That unflinching devotion to work, without which no real eminence in science is now attainable, implies the writing at certain certain times of the stern resolve upon the student's character: 'I work not because I like to work, but because I ought to work.' In science, however, love and duty are sure to be rendered identical in the end."

We feel assured that the regrets expressed by our parting guest at the circumstances which necessitate his early farewell will be shared by all. That he has succeeded in arousing a new interest in science among us is unmistakable; and that by his personal presence he has, if such be possible, increased the respect and admiration we had formed for him through his writings, is equally true. He carries away with him the expression of our cordial goodwill, coupled with the sincere hope that his return to our shores will be delayed to no distant day.

AN ELECTRICAL TOWER.

Mr. William H. Ward, of Auburn, N. Y., has suggested an electrical tower for accumulating natural electricity for telegraphic purposes. The structure which is to be placed on high mountain peaks or other elevated stations is to be made in three sections. The lower portion is a mere shell containing a door. Above this and insulated from it by a diaphragm is the middle part in which are openings or windows having slats pivoted in them, so that, by means of raising or lowering rods suitably connected to such shutters, the openings may be shut or opened. A projecting roof extends over the windows, serving to protect them from the weather and also for receiving the aerial electricity which may be drawn from it by wires for land line purposes. Above this roof is another insulating diaphragm. The highest portion of the tower is surmounted by a bent ventilating tube and vane, so arranged and connected with the rods acting upon the shutters that the revolution of the vane by the wind will open the windward and close the leeward slats. The wind therefore assists in driving an aerial current of electricity into the insulated middle portion of the tower, which current passes upwardly through the upper portion of the tower and out through the ventilator, thus forming a draft by means of which the electrical current is forced out at the vane. Insulated wires leading from the top portion of the tower allow a supply of electricity to be drawn therefrom.

By the use of the aerial electricity which surrounds the earth in the upper strata of the atmosphere, the inventor considers that artificial batteries may be entirely dispensed with, and a circuit formed merely by connecting the aerial current with the earth current. For instance, to bring Buenos Ayres, in South America, in direct connection with New York the following plan would be pursued: one electrical tower is erected on Pike's Peak or any other suitable high mountain in North America, and another similar tower on some suitable peak of the Andes in South America. The former would, by means of land lines, be connected directly with Denver, which place is again connected with all the prominent cities of the States. In a similar manner the southern tower is connected by land lines with prominent cities *via* Quito. New York telegraphs to the tower on Pike's Peak, and, the operator having connected the land line with the aerial current, the signals are transmitted through the aerial current to the town in South America, and thence—the land lines being suitably connected—to Quito and Buenos Ayres.

A Velocipede Race.

A fifty mile race on bicycle velocipedes recently took place at Wolverhampton, Eng., between two experienced riders, Moore and Johnson. Moore, the smaller man of the two, agreed to allow his opponent an advantage of two miles in the fifty. The first fourteen miles were run in 59 minutes and 23 seconds, the advantage being in favor of Moore. At the end of the twentieth mile the race seemed to be over, as Johnson was evidently suffering from having repeatedly to force his high wheel with short crank up hill against the wind. Moore, on the other hand, with small wheel and long crank, had no difficulty in making the ascent. On the twenty-seventh mile, Moore passed Johnson for the sixth time, who could now scarcely move his vehicle up the short hill, and, on the twenty-eighth mile, Johnson gave up the race. Moore finished the remainder alone, making the fifty miles in three hours 56 minutes and 40 seconds, and running the last mile quite as quickly as the first. At starting, in view of the odds given to Johnson, bets of three to one were offered that he would come off victor.

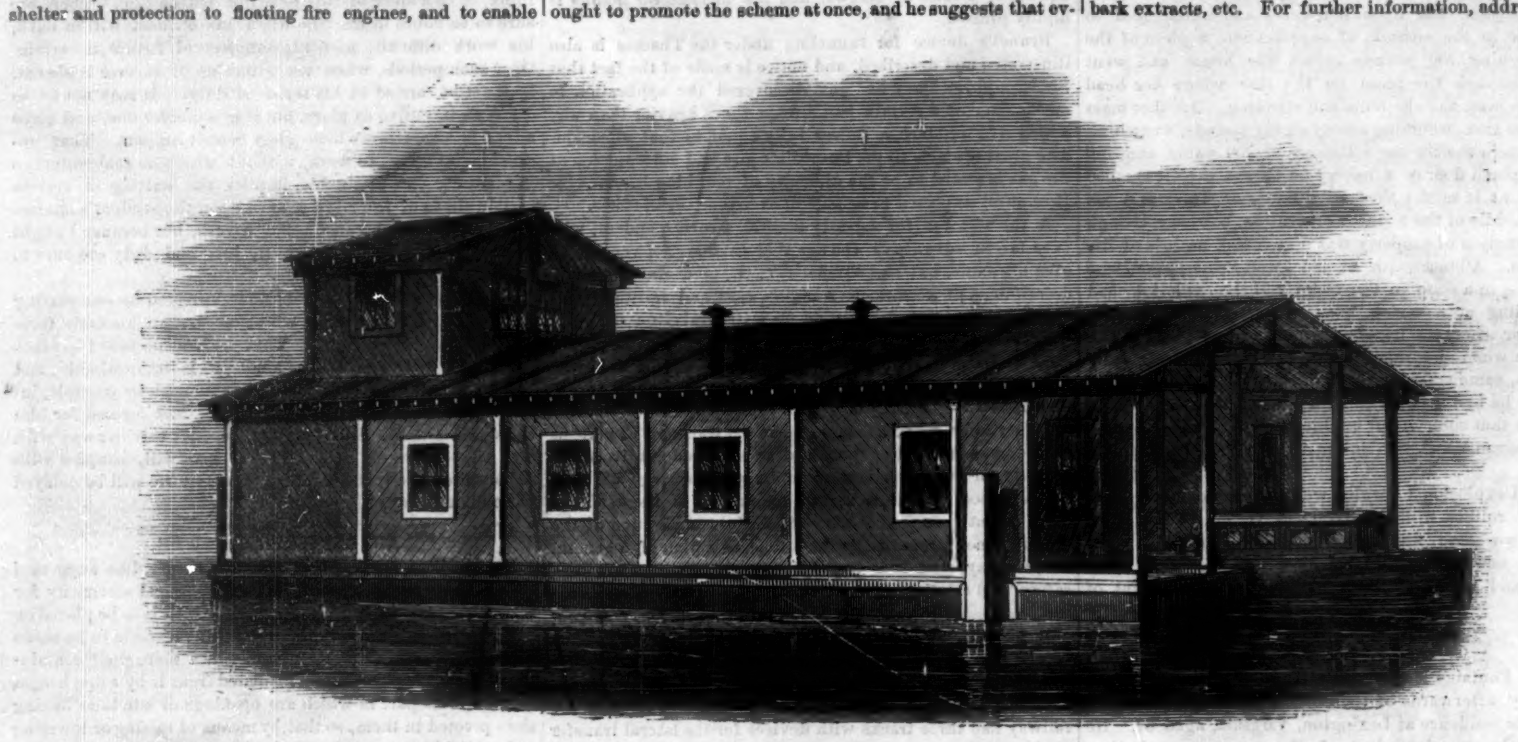
THE Leyden jar was discovered by Von Kleist in 1745. Chemical decomposition by voltaic electricity, was discovered by Nicholson and Carlisle, London, in 1800.

THE hight of thunder clouds from the earth has been observed, in India, to be from three to five miles.

FLOATING STATION FOR FLOATING FIRE ENGINES.

We herewith illustrate a floating station or dock for floating fire engines, which has been designed and lately patented by Mr. William H. Maw, and which is being introduced by Messrs. Merryweather & Sons, a firm who have been remarkably successful in the construction of small floating fire engines of the class which the station is especially designed to accommodate.

The object of the arrangement we illustrate is to afford shelter and protection to floating fire engines, and to enable floating fire engine vessels of comparatively small dimensions to be employed to greater advantage than is possible under ordinary circumstances. For this purpose it is proposed, by Mr. W. H. Maw, that the floating fire engine, when not at work, should be kept in readiness, under cover, within a suitable floating station or dock, which is permanently moored in the required situation, and may be placed in telegraphic communication with the shore and other fire stations of the district in which the floating station is situated. The floating station is constructed so as to carry firemen's quarters, coal and other stores, and apparatus for containing supplies of water, heated or otherwise, in readiness for feeding the boiler of the floating fire engine.



FLOATING STATION FOR FLOATING FIRE ENGINES.

The floating station is constructed with two hulls connected together below the water level by cross girders as well as by a roof overhead, the hulls being placed sufficiently far apart to accommodate the steamers between them. The cross girders must, of course, be sufficiently immersed to clear the keel of the floating fire engine under all circumstances, unless it be desired that the floating fire engine or engines should be capable of leaving the dock at one end only, in which case some of the girders may be placed at a higher level.

In the cases of some harbors where vessels, lying at moorings, are liable to have their bottoms rapidly coated or fouled by marine vegetation, or otherwise injured by constant immersion, the floating fire engine station or dock is constructed to keep the floating fire engine out of the water, for which purpose the hull of the station is built in compartments divided from each other by suitable watertight partitions, some of these compartments being capable of having water admitted into them. These compartments are made of such size that, when filled with water, they will cause the draft of the floating station or dock to be increased by an amount exceeding the draft of the floating fire engine, and the cross girders connecting the two sides of the floating station at the bottom are formed with cradles capable of supporting the float without injury, and so placed that, when the hull of the station is thus deeply immersed, there shall be sufficient water over them to allow of the floating fire engine entering the dock. When the float has been thus brought into position, the water is pumped out of the compartments by connecting the latter to the suction pipes of the pumps carried by the float, the dock rising as the water is thus pumped out, and carrying the float with it. On the float being required for service, water is at once admitted to the compartments above referred to, and the dock sufficiently immersed to allow the vessel to float off the cradle.

The construction of the station will be readily understood from the engraving, which we take from *Engineering*.

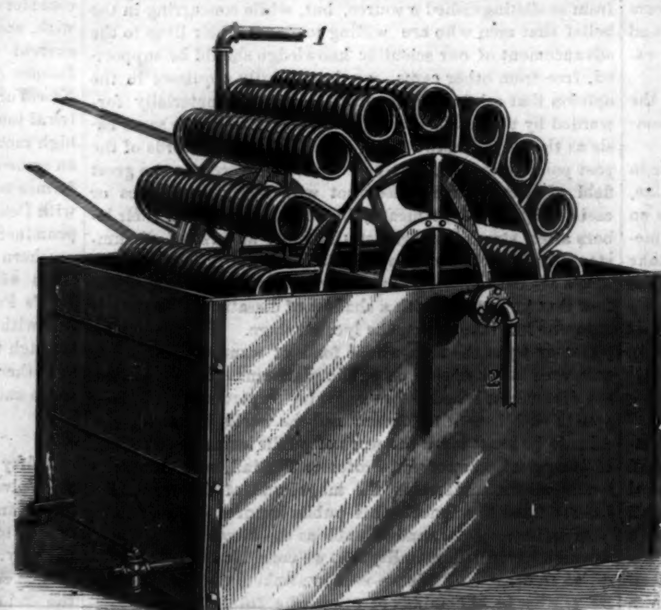
The floating fire engine stations are designed to obtain the following advantages: 1. They enable a small and handy class of floating fire engines to be used in the most effectual manner, by placing them at all times under the immediate attendance of their crews. 2. They afford complete protection for the floating fire engines, both from the effects of the weather and from chance damage from passing vessels. 3. By being placed in telegraphic communication with the land stations, they enable the floats to be brought into action without any delay. 4. They afford better accommodation for the men than can be given in the present large floats, while they also afford ample stowage for coals and stores.

The Proposed Million Dollar Telescope.

Some of our correspondents are determined to push this matter. W. L. L. says that the people of the United States ought to promote the scheme at once, and he suggests that every one of our readers should contribute to the object, and an appeal for assistance be made to Congress. He concurs with a previous writer that a charge for the use of such an instrument would amply remunerate the investors, and he offers $25 to help make a beginning. By similar liberality among all classes, the necessary funds could be raised; but the help of Congress to any such object should not be expected. There is no personal greed to satisfy, as there is in such cases as the Vienna exhibition, and no adventurer who will "lobby" the scheme through the two Houses; so the telescope must be constructed, if at all, by public spirit shown in voluntary contributions.

IMPROVED EVAPORATOR.

This machine meets one of the great requirements of the age, namely, a process of evaporation which, combining simplicity with cheapness, is within the reach of all; and as no mechanical knowledge is needed to run it, it is peculiarly adapted to out-of-town factories, plantations, etc.



BADOUX'S RAPID EVAPORATOR.

The evaporator is a strong wheel with hollow shaft, rims, and coils. 1 represents the feed pipe for introducing hot air or live or exhaust steam, which, meeting a check in the shaft, passes up through the arms into the rim, and is there distributed through the coils. 2 represents the discharge pipe for the air or condensed steam, which can be again utilized for heating feeding boilers, etc.

The tank can be made of wood or metal, and to hold such quantity as is desired. The wheel is rotated by hand, horse, or steam power, and it is said that it does not whip or froth the liquid, but lifts and evaporates it from the surface. When started, it can be left to do its work alone, the temperature being regulated at will by a globe valve in feed pipe.

This evaporator is no untried experiment, but can be seen in daily use at the works of the Rahway Glue Manufacturing Company, Rahway, N. J. The company claim to have evaporated 600 gallons an hour, and they invite all interested to visit the factory and see for themselves the actual working.

This evaporator is adapted for sugar, salt, dyes, wood and bark extracts, etc. For further information, address the sole agents, the Rahway Glue Manufacturing Company, P. O. Box 351, Rahway, N. J.

The Silk Worm in Japan.

The Italian silkworm breeder, Chiapello, who was lately enabled to travel in Japan, and visit the silk districts of Boshio, seldom entered by Europeans, publishes some interesting particulars in the *Moniteur des Soies*. Chiapello was greatly surprised by the almost complete want of mulberry trees. All mulberry plantations in that silk-producing province are hedges formed along irrigation canals, from twenty to twenty-five inches distant from each other; the single bushes are separated by a distance of from fifteen to seventeen inches. Great care is taken in properly manuring and watering these bushes till the fifth year. The Japanese consider the leaves from bushes four or five years old the best food for worms which are preserved for propagation, especially for those coming from the region watered by the rivers F'squama and Sirostaz. Besides the usual manure for the land generally, they give to each bush, from time to time, a few spoonfuls of finer compost, especially one prepared from a fish guano. The color of the eggs is said to be influenced by the kind of manure used; the latter, as well as the degree of manuring, is also stated to affect the produce.

This extreme care as to the food of the silkworm is a striking feature in the silkworm culture of the Japanese, which contrasts sharply with the carelessness practiced in this respect by European growers. The same care is observed in choosing animals for propagation, and a peculiar method is employed for selecting the strongest, consisting in temporarily exposing the cocoons to the influence of cold, whereby the weaker ones naturally die off. Another characteristic in Japanese silkworm breeding is that twice the room is given to each worm which is allowed for it in Europe. The detection of diseased animals is also worthy of notice. If a reddish point appears on the head, the worm is killed. Some districts have for centuries been famous for the excellence of their silkworms, and their eggs are largely used in Japan for propagation.

Longevity of Elephants.

It is stated by Sir Henry Stisted, who had a command in India during the Sepoy rebellion, in 1857, that some of the elephants employed by him had inscriptions upon their trunks showing their capture by the British forces at the celebrated battle of Plassy, nearly one hundred years previous. Pliny quotes Aristotle to the effect that elephants live from 200 to 300 years. In a vegetable-feeding quadruped, says Mr. Buckland, the duration of the teeth offers a fair criterion by which to judge of the probable extent of life, and we think that Sir Everard Home is the physiologist who has observed that the teeth of the deer and sheep are worn in much less than fifteen years; those of the ox tribe in about twenty years; those in the horse in about forty or fifty years; while those of the elephant will last for a century. The longevity of the last mentioned animal must be, therefore, in all probability, very considerable, although falling far short of the ancient estimate.

IMPROVED PAIL PUMP.

Our engraving shows a little pump introduced by Messrs. A. Paget & Co., of Loughborough, England. The apparatus is placed on a light cast iron stand, to which the bucket, holding five gallons, is bolted. A perforated screen covers one end of the passage in the cast iron stand, which, as shown, forms the inlet to the pump; the other end is closed with a flap valve.

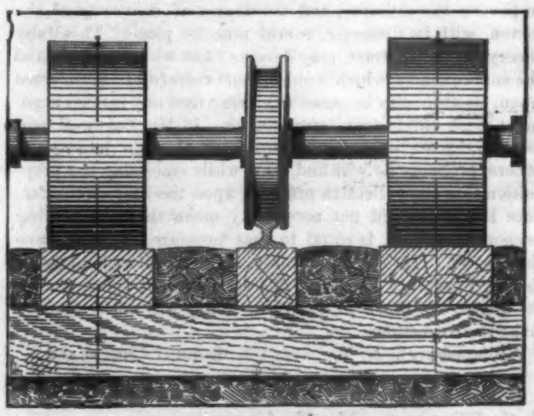
The pump consists of an elastic circular chamber, the sides of which are made of rubber, while the top and bottom are formed of cast iron plates, with an opening and valve in each. The form and dimensions of the air vessel are clearly shown in the engraving, as well as the position of the outlet and connection with the hose. Cast in a piece with the lower

part of the air vessel is a bracket terminating in a pedal. A spiral spring, attached at one end to the top of the bucket and at the other to the pedal, by a short length of cord, serves to keep the pedal always in its normal position.

The alternate pressure of the foot upon the pedal, and the contraction of the spiral spring when that pressure is relieved, compress and distend the elastic or bellows-like chamber, actuating the inlet and outlet valves and forcing the water into the air chamber and thence through the outlet. The whole apparatus, complete, weighs twenty pounds, and with it a jet of water can be easily discharged to a hight of from 30 to 35 feet, at the rate of two and one quarter gallons a minute. If desired, the jet may be distributed in spray, by the spreader shown in the illustration.

NOVEL AND CHEAP RAILWAYS IN PORTUGAL.

The question of working tramways by means of locomotive engines and light rolling stock is at present in course of receiving a practical solution in the kingdom of Portugal, where two lines of considerable length are now being made. One line runs from Lisbon to Cintra, a distance of 17 miles, whilst the route of the other is from Lisbon to Torres Vedras, about 60 miles. The first line is nearly completed, whilst the works of the second have progressed for about two thirds of its length. Both the tramways and the rolling stock, however, are of peculiar construction, says *Engineering*, and neither a railway nor an ordinary tramway, nor the two combined, will afford even an approximate idea of the principle adopted on these lines. The tramway consists of a central 42 lbs. rail of the Vignoles section, flanked on either side at a distance of about 20 inches with timber longitudinal sleepers, the three being secured to traverse sleepers, which are also of timber. Upon this triple



line run engines and carriages having one pair of broad wheels placed central to their length, and running on the timber sleepers, and at either end a bogie frame carrying for the engine two, and for the carriages one, double flanged wheel, placed centrally to the width of the carriage and working on the iron rail. In the locomotive the pair of broad wheels are the drivers, the small central wheels acting as guides. In the carriages, however, the exact reverse of this arrangement is observed, the bearing being taken by the bogie wheels, whilst the outer broad wheels act simply as guides. They are allowed a very wide margin of vertical play by means of American springs made with an india rubber core surrounded by a spiral steel spring. The bogie wheels are also carried by six springs of the same character. The carriages, in fact, are therefore, it will be seen, steadied and prevented from overturning laterally by the outer wheels. The gage of the line is determined by the outer wheels, which are 4 feet 2 inches from center to center of tyres, the longitudinal timber on which they run being of sufficient width to carry the engine wheels, which are 14 inches broad, the breadth of those on the carriages being $4\frac{1}{2}$ inches.

The engines have 11 inch cylinders, and weigh when empty a little more than eleven tuns, and loaded, 13 tuns 5 cwt., the tanks carrying 200 gallons of water. The locomotives are fitted with an ingenious hydraulic arrangement, by means of which the body of the engine is preserved in a horizontal position when it is either asending or descending an incline, so that the tubes are not uncovered by the water, the level of which is indicated outside. The power of each of the engines already made has been tested up to 300 tuns, which has been drawn by them on the level. The carriages are of three classes, those of the first class carry 16 passengers, the second class 20, and the third class 24. The carriages are 14 feet 6 inches long, and are divided down the center by a partition extending just above the heads of the passengers when seated, so that a means of communication is left open. The passengers enter the carriages from the sides, and are seated back to back. There are also first and second class composite carriages which carry 18 passengers; for merchandise, substantial goods wagons are provided.

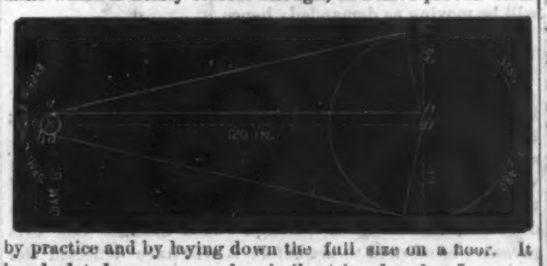
In order to test the system a strip of land has been obtained in Epping Forest, at Buckhurst Hill, where a piece of tramway road, 1,710 feet long, has been laid, with a short siding at right angles to it. The junction between the main length and the siding is formed by a curve 39 feet 4 inches radius, laid at an incline of 1 in 17. The main line—if we may so term it—is on an incline for nearly its whole length, the steepest gradient being 1 in 18$\frac{1}{2}$ and the average in 22$\frac{1}{2}$. Up and down this line and round these curves, a number of runs were made, both with full and empty carriages, at good speeds and with perfect success, at the rate of about 20 miles an hour, starting and stopping included. This corresponds with the results of a great number of runs which had previously been made over the same road, time being accurately taken. The system has been developed to its present degree of perfection by Mr. F. H. Trevethick, the engineer to the Lisbon Tramways Company, who has bestowed the greatest care upon every detail of construction; and we feel sure that under his care the system has been developed to the utmost, whilst the commercial success of the enterprise appears to be guaranteed by the large amount of both passenger and goods traffic between the localities which the tramways will connect.

Correspondence.

Finding the Length of Belts.

To the Editor of the Scientific American:

Your correspondent, J. B. Doolittle, gives a very nearly correct plan for finding the length of pieces to be put in or taken out of belting. I wish to know the best plan for finding the length of the entire belt. I send you a sketch of mine which is nearly correct enough, as I have proven both



by practice and by laying down the full size on a floor. It is calculated, as you see, by similar triangles, but I want a shorter way if there is one. A SAWYER.

Chester county, Pa.

Polar Mutation.

To the Editor of the Scientific American:

Mr. J. Arnett, C. E., in the SCIENTIFIC AMERICAN of January 25, accounts for the terrestrial changes in past ages (which have been made manifest by the geological survey of Ohio) by polar mutation, or, in other words, by supposing a change of position of the earth's axis with respect to its surface.

We learn, from a study of celestial mechanics, that the earth's axis is continually changing its position with respect to a fixed point in space; but we have no evidence that it is changing, or ever has changed, its position with respect to the surface of the earth. On the contrary, it may be demonstrated that such polar mutation could not result from any known cause. Laplace says; "The momentary axis of the earth coincides with its third principal axis, and its poles of rotation always correspond very nearly to the same point of its surface." (See *Mécanique Céleste*, volume ii., page 859.)

Before assuming that polar mutations are the cause of observed physical changes in the structure of the earth, it should be shown that such polar mutations are mechanically possible. But this can only be done by assuming some external, accidental, and transitory force, about which we know absolutely nothing.

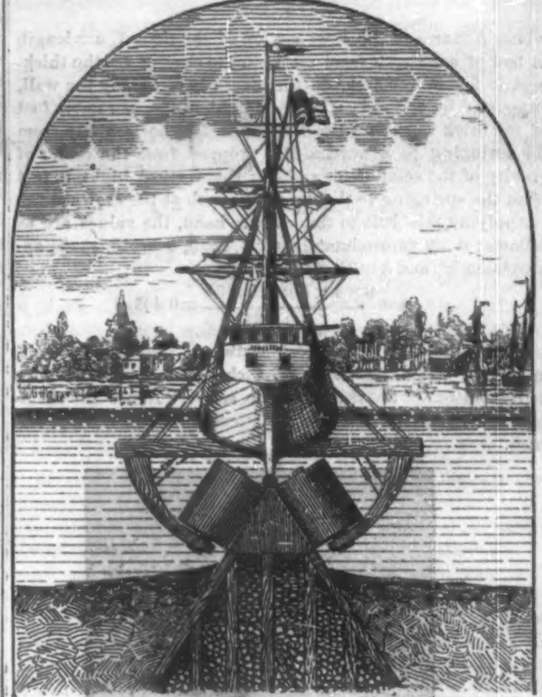
Des Moines, Iowa. J. E. HENDRICKS

A Marine Camel.

To the Editor of the Scientific American:

I send you a plan for a marine camel, as suggested by the article by Mr. C. W. Stewart, in the SCIENTIFIC AMERICAN of January 18, 1873, for carrying full laden vessels across the bar at the mouth of the Mississippi river.

The back of this marine camel may be partly, or the whole of its entire length, submerged; each end would have to be submerged to a depth sufficient to allow the vessel to float into, and out of, a receiver, already mounted upon the track. The entire weight, when out of water, would be pivoted on the crown of the prism, this prism being composed of wood and stone, and the crest surmounted by a huge iron rail of



circular form, running the entire length of the prism. The equilibrium of the load is to be preserved by means of two revolving flanges for each burthen wheel; the flanges are to lap on the central wheel, and extend down each side of the prism to its base. This locks the carriage to the prism, so that the action of the waves could in no way interfere or displace the carriage from the prism.

I submit this plan for a marine camel, first, because its form admits of extending to any dimensions, without necessitating changes in carriage; and, secondly, because the form is the best calculated to withstand the action of the elements, and to give the greatest amount of strength, vertically and laterally, with the least amount of material; and, thirdly, no long axles are used, and, moreover, the strain and motion imparted to the vessel while in transit would be something similar to that when riding upon the waves. E. CREW,

Inventor and Patentee of Prismatic Railway.

Opelika, Ala.

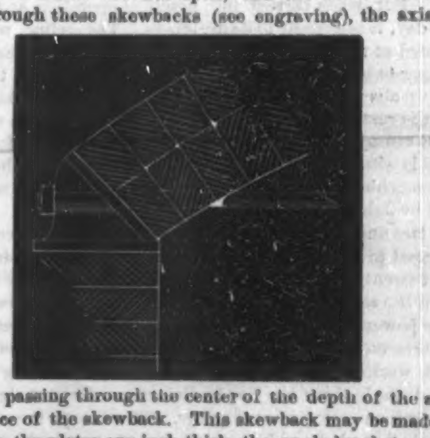
Iron Supports to Brick Arches.

To the Editor of the Scientific American:

I want to build an arch of brick, of 16 feet span, 20 feet length, and 9 inches thickness, with a rise or crown of about 3 feet. The walls on which it rests are light, and I want to support it with iron cross rods at spring of arch. Of what strength should the rods be, and how many will I need? Is there any rule to compute the outward strain of arches?

Millville, N. J. A. E. B.

REMARKS BY THE EDITOR.—If the arch has only its own weight to carry, it will need four tie rods of one inch diameter, one placed at 30 inches from each end of the arch, and the other two at equal distances between. At each springing of the arch there should be a skewback laid upon the wall to commence the arch upon, and the tie rods should pass through these skewbacks (see engraving), the axis of



the rod passing through the center of the depth of the arch at the face of the skewback. This skewback may be made of cast iron, the plates one inch thick, the angle brackets set at each end and at every 30 inches in the 20 feet. One of these brackets will occur at each rod, and is to have the hole for the rod pass through it, the metal being swelled out around the rod so as to afford a flat bearing for the head and nut of the rod. If the arch is to be levelled up with sand, concrete, or other filling, or is to carry any other load, then the rods should be larger.

There is a rule for finding the horizontal thrust of arches, but it is too complicated for insertion here in all its generality. For this particular case, however, the following rule approximates near enough for all practical purposes:

Approximate rule: Multiply the cubical contents in feet of the semi-arch, by the weight per cubic foot of the brick work and by the horizontal distance in feet of the center of gravity of the semi-arch from the springing, and divide the product by 7,000 times the hight in feet from the springing to the top of the arch at the crown, and the quotient will be the area in inches of the cross section of the tie rod. This area should be the area of the rod at its smallest part, for example, the bottom of the thread of the screw at the end.

Algebraically, the rule may be stated thus

$$A=\frac{a\,t\,l\,w\,s}{7000\,h}$$

where A=area of the cross section of the tie rod, a=length in feet of semi-arch from springing to crown; t=the thickness in feet of the arch; l=the length in feet along the wall, supported by one rod; w=the weight in lbs. per cubic foot of the brick work; s=the distance in feet horizontally from the springing to a vertical line dropped from the center of gravity of the semi-arch; and h= the vertical hight in feet from the springing to the top of the arch at the crown.

Applying this rule to the case in hand, the values are as follows: $a=9$ approximately, $t=\frac{3}{4}$, $l=5$, $w=110$, $s=3\frac{1}{2}$ approximately, and $h=3\frac{3}{4}$. Hence

$$A=\frac{9\times\frac{3}{4}\times5\times110\times3\frac{1}{2}}{7{,}000\times3\frac{3}{4}}=0{\cdot}495$$

This is the area of the cross section of the tie rod, the diameter of which is about 0·795 inch. This is the diameter at the bottom of the thread of the screw. Hence the diameter of the rod before the screw is cut ought to be about one inch.

The rule here given is based upon the conditions that the arch is not required to carry any load, the metal used is to be of fair average quality, and the work well done. The cast skewbacks may be made in two lengths of 10 feet each for each wall, and bolted together endwise by bolts through ears or lugs.

The Mount Auburn Incline Railway of Cincinnati.

To the Editor of the Scientific American:

Few quick transit railway enterprises have been so productive in final results as the Cincinnati inclined railway, which is known as the Mount Auburn Incline Railway of Cincinnati. It was commenced on May 11, 1872, and its construction is due to the skill and energy of a few of Cincinnati's best citizens, such as G. A. Smith, Stacy Hill and James Dougherty. It should be described to show the West Hoboken and Hudson City people that, had they a few such men, they would never put up with the slow, tedious, and dangerous transportation, by which they now travel and will travel till a horse railway is laid direct from the ferry to Palisade Avenue, running straight across the flats and then ascending the hill, not by the hundred steps but by an inclined railway at an angle of forty-five degrees, or even steeper.

Heretofore all the communication between the city of Cincinnati and Mount Auburn has been by a roundabout way by horse cars or by a rather more direct route by stage, both of which were long and tedious. The stage route was much more tiresome, for it was necessary to employ four horses to a stage, and the car was obliged to stop several times to rest the exhausted beasts. And when, in the winter time, the roads are covered with ice, it was the next thing to impossible to get up at all. Under such circumstances, it was not, perhaps, a brilliant idea to conceive the plan of an incline railway. But, when carried into practical operation as we find it to-day, it is a credit to its designers. The incline, which is situated at the head of Main Street, is 857 feet 6 inches from bumper to bumper, and there are two grades; from the bottom up about two hundred feet the ascent is 32 feet in 100, and the rest of the grade is about 26 feet in 100, making about 275 feet rise on the whole line. At the top of the incline is situated all the machinery for working the cars. This machinery, which is quite extensive, was designed and built by John Cooper and Co., of Mount Vernon, O. There are 2 two flue boilers, about 47 inches diameter by 22 feet long, arranged to work together or singly. These are stationed about twenty feet from the head of the incline, and further on, in the rear of the boilers, are placed two engines of 30 horse power each. The engines are connected together at quarters on the same shaft, with a pinion between them which works into the wooden cogs of the elevating drum. This drum is about ten feet in diameter and about eight feet in length on each side of the cogs. These cogs are about 3 or 3½ inches pitch, and are stepped, or staggered, so that, when the engines are running up to full speed, there is not the least jar or jerk to the car or to any part of the machinery. At the head of the incline, there is a very ingenious automatic brake for stopping the cars should one of the hoisting ropes break. If it would not take up so much space I would describe it more minutely; but I will only say now that it is considered perfect in its working and has beautifully stood the tests to which it has been put.

There are two cars, one going up while the other goes down, and nearly balancing each other. To each car there is attached two ropes of 1¼ inches steel wire; one is used for the hoist rope, while the other merely runs idly over the safety wheel and is only brought into play if the hoist rope breaks on either one of the cars. Directly over the safety apparatus the engineer has his room; and from this position he can see the entire length of the incline. From this room the whole working machinery is operated by one man standing in full view of the cars and track. To his right he has his reverse lever which works the links on the engines 60 feet to the rear of him, and to his left he has his throttle lever, which is connected with the throttle valves on the engines by long light rods running on rollers or sheaves; and with his right foot he controls the brake on the elevating drum, by which he is enabled to bring the cars up easily against the bumpers. It is surprising to see how easily the engineer can stop the car without causing any bumping. I have seen him stop the cars time after time, so easily and at the same time so quickly that it seemed as if it would be impossible to draw a sheet of paper through between the bumpers on the end of the car and those at the head of the incline. In the engineer's room there is also a telltale to show the exact motion of the engines while running, and also a long lever attached to the aforesaid safety brake. This is used only in case of accident, to enable the engineer to have full control of every part of the machinery, although, as I have already stated, the safety brake is automatic in its operation; but the lever makes the brake doubly safe, which is of great importance where so many people are constantly going up and down.

There was a little timidity felt at first by some who were obliged to go up the hill and had for many years used the stage coach, but it did not take long for them to banish all fear. The cars can easily carry sixty passengers in a load; and at one time last summer, during the hot season, they carried nine thousand people in the course of six hours. One feature of the road is the accommodation; the managers will run up a car for one passenger as willingly as for sixty.

Their system of signals by bells is perfect. The time taken in making a trip from top to bottom is about thirty-five seconds, which is found to be much better than fifteen minutes by the stage or horse cars, especially when the thermometer stands at 25° below zero. There is some talk of erecting two more incline railways in the spring, for the accommodation of people in other parts of the city, for they will go back upon the high land to live, railway or not. The builders of the machinery which is already running will probably be consulted in relation to the new roads, for their experience on the first incline has brought out a great many points which will give an immense advantage, not to them only, but to the company putting up the road.

Mount Vernon, O. — O. C. WOOLSON.

Timed Turbines.

To the Editor of the Scientific American:

The following view of the turbine may be interesting to many of your readers:

It is believed that the final solution of that hardworked problem, as to how the water propels the turbine, relates simply to time, thus; Moving water is a strict observer of time; it falls, flows, curves, bends, etc., in a certain time. Man demands that the turbine shall make certain time (speed), discharging the water at a certain time; but he forgets that the water, and not he, fixes the time in which it will be moving as demanded; hence,

"Nature, and not man,
"Has fixed the law, then change it if you can."

As the above only specifies that nature, not man, fixes the issues, the information given falls short of practical value; but this is as intended, leaving to others to fix, philosophically or experimentally, the exact point. The question would be simply this; As the greatest attainable pressure of the head water upon the buckets, as the propelling force, is desirable, how long or through what distance can this pressure be allowed to act before it will have deflected the water from its forward motion to that proper for the discharge, as here, of course, is the point for the issue?

Fair Grove, Mo. — J. B. REYMAN.

REMARKS BY THE EDITOR:—We suspect that our readers will feel more confidence in the *facts* deduced from experiment than in conclusions based upon metaphysics, however ingenious and interesting. In the present case, experiment has well determined the laws governing the action of turbines, and our correspondent will be better satisfied with the work of Wiesbach, Rankine and other authorities than with his own.

A Meteor in Nova Scotia.

To the Editor of the Scientific American:

A very brilliant meteor was observed here on January 25, about 7 P. M., and the circumstances are worthy of note.

About the time mentioned, I was walking along the street when suddenly my attention was arrested by a very bright light, which illuminated the surrounding scene; at the same time I heard a whirring noise overhead, and, on looking up, I beheld a meteor of large size moving along the sky. In a few seconds from the time I first observed it, an explosion occurred and fragments of the meteor, of varied colors, were scattered in all directions about the sky.

I have on many occasions observed meteors of rare brilliancy and great magnitude, but I do not remember any accompanied by such rare phenomena. — J. R. S.

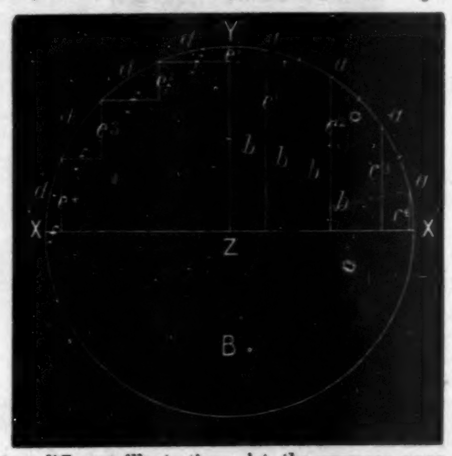
Halifax, N. S.

Bursting Cylindrical Boilers.

To the Editor of the Scientific American:

It is to be regretted that this subject is still being discussed in your widely read journal as a matter still in doubt; and that the authority of Professor Henry and other "eminent scientists, both of England and this country," is claimed as as endorsing the fallacy still adhered to by Mr. Bakewell. He claims that, in a boiler B, of a diameter 1, and with an internal collective pressure represented by 3·14 acting upon its whole circumference, the half circumference X, Y, X, measuring 1·57, would represent the measure of force tending to separate the upper half of the boiler from the lower half at X, X. On page 83 in the SCIENTIFIC AMERICAN of February 8, Mr. Bakewell gives an illustrated intended proof of his proposition, which is as hopeless of being conclusive as that of the student, who, with diploma in his pocket and brimofull of science, returned to his doting parents, and, sitting down to a cosy supper of which two birds formed a main dish, to illustrate his learning, remarked: "I will prove to you that these two doves are three." "Glad of that, my son, mother and I will take these two; you take the third." The student's chance for the third was not a bit worse than Mr. Bakewell's for the extra force he claims as tending to burst a boiler. I hope I may be more fortunate in giving a convincing illustration.

The half circle X, Y, X, being divided into, say, eight parts, each arc, a or d, would have a pressure upon it of $\frac{1\cdot57}{8}$. To



use two different illustrations, let the pressure upon arcs a, a, a, a, be represented by the four dotted radial lines b, b, b, b, bisecting the arcs centrally. The vertically acting forces will then be represented by the vertical lines c^1, c^2, c^3, c^4; and no other vertical forces can be shown to exist. Thus the vertical pressure tending to tear the boiler at X is to the pressure upon the ¼ circle X, Y, as the sum of the lines c^1, c^2, c^3, c^4, is to the sum of the radial lines b, b, b, b, or as 1 to 1·57, nearly, (the result is as 1 to 1·562, the approximation becoming closer as the number of subdivisions a, a, is increased). Or, taking the left hand illustration, the pressure upon each arc d, d, d, d, being $\frac{1\cdot57}{8}$, the resultant vertical pressures will be e^1, e^2, e^3, e^4, which equal radius Y, Z, and are, when added up, ½; while the horizontal forces are represented by the lines f, f, f, f, equal to radius X, Z, or to a force of ½, which tends to tear the boiler at Y. Let the question be examined in still another way. Suppose the upper half circumference removed, and a rectangular shell put in its place, or a straight plate across along the diameter X, X; what then becomes of the tearing pressure at X, X, claimed to be measured by 1·57? And yet it is a fundamental law which cannot be questioned that the tearing pressure at X, X, so long as these points remain the same distance apart, is the same, no matter what the configuration of the vessel above it may be, whether it be spread out to thrice the width of X, X, or thrice as high, convex, concave, undulating or any other shape whatsoever.

As a fruit of this deplorable delusion, a patent has already been issued upon a convex or concave piston, claiming, upon this theory, to obtain greater pressure than can be obtained by a usual piston. In calculating the power of an engine upon this theory, the transverse section of the cylinder ceases to govern the estimate, and the degree of convexity of the piston, with its diameter, would take its place. This false theory, in the abstract, may deceive; but when applied, and the consequences which would result therefrom are reflected upon, its absurdity becomes so glaring that any further argument must surely seem superfluous. If Mr. Bakewell will carefully read over again Professor Henry's letter (and others) probably he will find that, while endorsing the proposition that the collective pressure upon the half circumference is 1·57, he did not necessarily mean that the tearing pressure, at X, X, is equal to that pressure. Let us have that letter. If it indisputably endorses Mr. Bakewell's theory, I can only exclaim "To err is human—even among the mighty!" But if so, Professor Henry will not hesitate to make the correction.

Williamsburgh, N. Y. — ROBERT CREUZBAUR.

Cooling and Heating our Houses.

To the Editor of the Scientific American:

In regard to the plans and remarks of Mr. Dodge in your issue of February 1, 1873, I desire to make an explanation in defense of my suggestions in your issue of October 14, 1872, to which my abbreviated name "Egbud" was subscribed, and to describe my inventions for simplifying the heating and cooling of our dwellings.

Mr. Dodge says that: "Unless the air in the building was at a higher temperature than that outside, the current would

be from the house through the tunnel and chimney. In warm weather, the air would be heated in our dwellings, and it is also in winter heated by fuel; so that if the space in the tunnel or pipes is corresponding to the size of the dwelling, either in breadth or length, it must draw in the outer air, which becomes modified and purified by the earth. Oxygen is left free to sustain life and produce combustion, and the direction of the air current is natural, as the escapes in building are higher than the air chimney. In mining shafts, of few feet depth, the modifying influence of the earth is sensibly felt; and among our large class of miners, who inhale the air changed by underground currents, many diseases are unknown. My invention for the action of earth on air for cities is both simple and cheap. It is to make an excavation like a ground cistern, close by the house, if necessary, and then take clay pipes, with joints to fit, and lay them from the bottom connecting passage in a square, one upon each other. An outer and inner square is desirable, up to the earth's surface; then fill up the space with earth and connect to a chimney of sufficient hight to be above impure surface air. An iron box, filled with wooden flues, or two such, can be used, and any length of air passage can be obtained. For heating purposes, the air would be of genial warmth when coming in contact with the heater, and would save a large per cent of fuel; and as the heater need not be at a high heat, the life sustaining particles would not be destroyed. It is only where the air is impure through some cause that dampness is required to renew vigor.

Of course, action and reaction produce change and purification; but how shall we seek and produce it, by costly heating and steam apparatus with fans, or by Earth's laboratory, in conjunction with Nature's regular laws?

Mr. Dodge and the engineers of our government buildings would find much expense saved by modifying the air as described, before forcing it to its destination.

Budd's Lake, N. J. ENOS GOBLE BUDD.

Entomology in Congress.

To the Editor of the Scientific American:

I notice, in an article under the above heading, on page 64 of your current volume, some strictures upon the debate in the House of Representatives, at Washington, upon the Department of Agriculture. Allow me to thank you, in behalf of myself and thousands of other farmers all over the country, for thus speaking a good word for us. I am glad that Mr. S. S. Cox belongs to New York and not to the State of Maine, for the honor of which latter I have a sensitive regard.

Cudgel, soundly, Mr. Cox and any one else who exhibits so unmistakably his Darwinian relationship, not to the monkey, but to a certain long eared quadruped whose stolidity is proverbial. Belabor him well; but yet I fear that as little good will come to him from your lusty blows as would come if they were aimed at his four-footed cousin. We take a kind of malicious pleasure in seeing the chastisement administered, just because it is aimed at culpable ignorance.

When the farmer sees the crops over which he has spent his time and energies, his fruit, grain, vegetables, cotton, grass, everything, damaged, in his own fields or others, to the extent of millions of dollars annually it does not matter whether the destroyers have the proportions of elephants or of microscopic insects. Very gladly and hopefully he looks to the scientific men of the land to show how the enemy can be restrained and the crops saved. Let the "bug hunters" be sustained and encouraged, for our insect foes are many and alarmingly destructive.

Thus much to you, Mr. Editor, to let you know that your efforts are noticed and appreciated by farmers as well as by those engaged in purely scientific pursuits.

Naples, Me. SAMUEL F. PERLEY.

Science and Theology.

To the Editor of the Scientific American:

Your excellent article entitled "Can buildings be set on fire by steam pipes?" leads me to lay before you the following deductions, based upon the acknowledgment of water being emblematical of the God of Heaven in life and power, etc.

1. The life of God, having been manifested to the world for its salvation, not for destruction, He will never permit the destructive element of fire to originate in any of the natural emblems of His spiritual existence, one of which is steam produced from pure water.

2. The life of God, being eternal, precludes the idea of man ever being allowed to consume water, its representative, consequently it will never take a place in the economy of nature for illuminating purposes.

3. The omnipotence of God being indisputable, man has a legitimate field from which to develop power, the basis of which is pure water.

Valleyfield, Pa. JAMES HALLY.

P. S. Your reply to A. J. S., anent "perpetual motion," is very good indeed. The living God alone gives life. So far, a mere man never has, and never will create it, or its equivalent, perpetual motion. J. H.

Specimen Boiler Inspection.

To the Editor of the Scientific American:

Seeing in a recent issue of the SCIENTIFIC AMERICAN an account of a specimen of boiler inspection, I would inform your correspondent that the party claiming to be an inspector is a fraud and an impostor. There was a law for the inspection of steam boilers, which called for one chief inspector (Mr. John B. Leverick, under Governor Hoffman), and one deputy in each congressional district outside of the police district, to inspect steam boilers. But that law was repealed on February 3, 1871, and there is no such law now in existence; but some of the deputies have been working under the old law in Westchester county up to a few months ago, inspecting steam boilers and demanding six dollars for such inspection. Is it not a fraud on manufacturers, brewers, etc., to make them pay for the inspection of their boilers under a law which is not in existence?

T. LEON CHESTER, Consulting Engineer.
No. 201 Varick street, New York city.

ENGINEERING NOTES.

[Extracts from papers read before the American Society of Civil Engineers.]

In a paper upon "Rail Economy," C. P. Sandberg, C. E., of London, gives the following regarding

IRON RAILS.

The American demand for English rails, of say 500,000 tuns yearly, is unlikely to diminish soon. The late increased expense of iron adds to the cost of railroad construction, and tends to reduce the quality of rails. Welsh rails were often imperfect in weld; now they are sometimes also brittle. In the Cleveland district, rail making has greatly improved, chiefly by the increased application of fettling in the puddling furnaces. Still the buyers must guard against lamination and brittleness, by tests for strength and wear, applied before the rails are laid. Rails made of suitable iron, with proper section, will not break in winter; in Scandinavia, with a climate more severe than in America, no accident has occurred from broken rails, though cross sleepers are exclusively used. But a very small portion of the iron rails shipped to America will stand the proper tests.

No late improvement promises so much to perfect iron rail making as mechanical puddling. By means of the Danks and Spencer appliances, more rails can be made at a reduced cost and of a better quality.

STEEL RAILS.

The demand during the past year has been so great for steel rails that they can hardly be obtained at any price: the supply is limited by the lack of ore free from sulphur and phosphorus, and recourse has been had to extensive mines in Spain. It is hoped that America will supply herself with steel rails, and import only those of iron required for new lines or light traffic. There is a scarcity of suitable ore for the Bessemer process throughout Europe, except in Sweden, where the recently discovered coal will render the ores more available.

The Siemens-Martin process of steel making (superior to the Bessemer in requiring a less pure ore), has thus far produced so little that it can hardly be called a source of supply in the great market.

Steel rails are now so well made that they rarely break, except when the flange is punched, and this should be done only while the metal is hot, or the notch drilled and then slotted. Although a steel rail is generally thrice as strong as an iron one, when punched or the flange is cracked the iron may be the stronger. The steel is made as soft as possible, say with one third per cent of carbon; for not by hardness, but by homogeneity, is it superior to iron. Usually a steel rail will carry one fifth more dead load than an iron one; hence, for the same traffic, the steel rail, in comparison with the iron, should not be reduced in weight more than 20 per cent.

Buyers should require each rail to be permanently marked to indicate date, maker's name, and quality, that subsequent use may determine which manufacture is best.

TRAFFIC CAPACITY.

The amount of wear or life of a rail is usually expressed in tuns passed over it before rejection; properly the speed of travel should be taken into account, and 220,000,000 speed tuns is a fair expression of the endurance of extra iron rails.

The average life of iron rails in England for ordinary traffic is about 10 years; in and near London it is 2 years or less; on the continent, from 12 to 15 years; and in Sweden, with less traffic than in England, from 15 to 18 years.

The weight passed over good iron rails before rejection, has been found to average 10,000,000 tuns; this may be taken to represent the life of extra iron rails, and six times that, the life of good 56 pound steel rails. On the London and North Western line, steel rails have lasted 20 times as long as iron, and on the Metropolitan Railway, with the greatest traffic in the world, where iron would not have lasted six months, steel will stand from three to four years.

Equally important with the weight of a rail, is a proper section. In England the double-headed rails are still generally used, and elsewhere in Europe the flat bottomed pattern, as also in America. A specially bad section is the Erie 61 pound rail, which could be replaced by a 45 pound rail, well proportioned.

The late Professor Rankine says that the weight of the rails per yard should equal 15 times the greatest load on the locomotive drivers in tuns. Perdonet, in France, takes 12 in place of 15; the writer, by adopting a section which permits a fishjoint stronger than the others in general use to be made, takes 10 and less; thus for a 60 pound rail, the weight on drivers is put at $6\frac{1}{4}$ tuns.

Fish plates of steel will enable rails to carry from 15 to 20 per cent greater load than if iron were used of the same section.

The Philadelphia and Reading Railroad, on rails made with great care by the company, prefers not to exceed 4 tuns on a 64 pound rail, and the rail section has been gradually increased to counteract wear and tear from even this medium load.

On the Erie Railway, $5\frac{1}{8}$ tuns weight on drivers has been found too great for best 70 pound iron rails, and, with a speed for heavy freight trains of 15 miles per hour, should not exceed $4\frac{1}{2}$ tuns.

EXPERIMENTS ON THE RESISTANCE OF STONES TO CRUSHING.

Mr. C. B. Richards, C. E., has recently experimented upon various kinds of American building stones worked into 1 inch and $1\frac{1}{2}$ inch cubes, with flat and smooth faces.

The specimens were crushed between the plane faces of two hardened steel hemispheres, the curved portions of which were seated in corresponding cavities of steel blocks, fixed in the machine. Single thicknesses of lace leather were interposed between the stones and metal surfaces; thus the pressure was uniformly distributed; it was in all cases applied to the faces of the cubes parallel to the natural bed of the stone, and carefully increased to rupture by pouring shot into the hollow weight by which the strain was caused.

Sixteen specimens of granite from 6 quarries gave from 8,620 to 15,622 pounds, minimum, 9,838 to 18,778 pounds, maximum strength. Fourteen specimens of sandstone from 3 quarries gave 5,806 pounds minimum, and 8,956 to 10,928 pounds, maximum strength. And 10 specimens of white marble from 3 quarries gave from 3,905 to 12,917 minimum, and 5,976 to 13,972 pounds, maximum strength. Each was a 1 inch cube. The specimens failed by breaking into slender prisms and pyramids with axes normal to the pressure.

In a paper upon

ROCK DRILLING,

it is stated that a percussive steam drill, with 3 inch cylinder and 6 inch stroke, making 300 to 375 strokes per minute will drill in the coarse gneiss rock common to New York Island, $3\frac{3}{4}$ inch holes at the rate of 3 inches, $1\frac{3}{4}$ inch holes at the rate $4\frac{1}{2}$ inches, and 1 inch holes at the rate of 5 inches, per minute.

THE CHARACTER AND POSITION OF NEUTRAL AXES AS SEEN BY POLARIZED LIGHT.

Mr. Louis Nickerson, C. E., states that the results of experiments made by him show that the neutral axis is a flexible line, truly parallel to the top and bottom sides of a rectangular beam, and passing through the center of gravity or its sections *only* when the load is evenly distributed from end to end, or when the beam is infinitely long; and that when there is a local pressure, the neutral axis is more or less governed in its direction and form, by the strain passing from the point of local pressure towards the point of support. The same writer says that in tests made upon columns which changed their forms under pressure, a series of extended rings or periodic waves appeared uniformly separated after the columns had assumed permanent form. He considers that hollow columns if sufficiently under stress within elastic limits may be greatly strengthened by bands placed where these waves would otherwise occur. It is inferred that one third additional material will thus double the strength of the column.

THERE is in course of construction at Woodward's Gardens, San Francisco, a salt water aquarium of modest dimensions, yet designed to be complete in all its parts. The aquarium will be mainly under the surface of the ground, in order to secure an even temperature. There are fifteen tanks in all, one of which is for fresh water specimens. The tanks vary in size from 300 to 1,000 gallons capacity, the largest containing eight thousand pounds of water. Several of the tanks are fitted up with sea worn rocks, some obtained at the Cliff house, and some at Santa Cruz. There will be room for marine plants, shells, corals, etc. It is the intention to obtain deep sea animals and other rare denizens of the deep, with a live shark or two, a devil fish, etc.

MANUFACTURE OF ELECTRICAL APPARATUS.—The Siemenses have extensive works in Berlin, in St. Petersburg, in London, in Vienna, in Dresden, and in Tiflis. The Berlin establishment, it appears, employs 550 workmen, and sent out in the first half of last year the following apparatus: 700 electro-magnetic and 1,750 magneto-electric pointer, 12,060 Morse writer, 12,497 railway bell signaling, and 231 Hughe's type printer. That is only one example of the way American inventions are copied on the continent. The firm (Siemens and Halske), now consisting of Ernst and his brothers William and Charles, celebrated in October last their twenty-fifth anniversary, when a sum of $40,000 was set apart as a pension fund for the workmen.

M. FOUQUE describes a visit he paid to the Azores in 1867, having been attracted by news of a volcanic eruption taking place in the sea, near Terceira. This had spent itself before he arrived, but he went to the scene in a boat, and bottled some of the gas from a part where the water was in a state of ebullition. He found it to contain chiefly hydrogen and compounds of hydrogen. The Azores are, in formation, a true type of marine volcanic regions.

PROGRESS OF HOOSAC TUNNEL TO FEBRUARY 1, 1873.—Extensions of headings in January, 297 feet; opened from east end, westward, 13,340 feet; opened from west end, eastward, 8,859 feet. Total length opened, 22,199 feet. Length remaining to be opened, 2,832 feet, being 193 feet more than half a mile.

THE consignment of half a million of salmon eggs from Germany, heretofore noticed by us, has arrived at New York in good condition and is considered important. In England some extensive importations of salmon eggs from Norway have lately been made.

THE dip or inclination of the magnetic needle was discovered in 1576 by Robert Norman, an optician of London. He first constructed the dipping needle.

IMPROVED ROAD SCRAPER.

The invention herewith illustrated is a convenient machine, recently patented, for scraping and leveling roads. It is especially suitable for removing the weeds and small obstructions on the carriage ways of cemeteries, public parks, gardens, etc., and, being actuated by horse power, will doubtless be found an efficient and valuable substitute for the slow and tedious work of the hand shovel hoe.

The apparatus is mounted, as shown, upon four wheels, the axles of which are connected together by the longitudinal braces, A A. At B are a number of peculiarly shaped bars, through eyes formed in the ends of which the forward axle, C, passes. These bars extend back to the rear of the machine, and their extremities are bent down so as to form an obtuse angle resembling a culti vator tooth. D is the rear axle cast with a number of pendent partition pieces, E E, which serve to keep the bars at a uniform distance apart. Attached by suitable standards to and above the rear axle is the rock shaft, F, the ends of which are bent to form arms, one of which is shown at G. To these arms, by rods, H, are fastened a transverse bar, not represented, which passes under the bars, B. In the socket on the rock shaft, F, is placed a lever, I, which is worked by the person using the machine.

When the device is in use, the ends of the scrapers rest upon the ground. The scraping teeth, it should be noticed, cover the entire surface, notwithstanding the bars, B, are separated by the partitions, E. As the machine is drawn along these scrapers tear up all grass or weeds, leaving the ground level and clean. In case, however, an obstruction is met, the bar, striking the same, will be raised by the contact and, having free movement, being only held by the forward axle acting as a pivot, will pass over the obstacle, and drop again by its own gravity to its former position.

The bars, B, are of varying lengths, and are arranged so that their rear ends form nearly a right angle. The pieces, J J, are a number of weights so arranged as to slide along the upper edges of these bars, and are held in any desired position by set screws. Their object is to give increased pressure to the scrapers at the ends of the bars when the machine is used on hard ground, and their effect is of course augmented or diminished as they are moved toward or away from the scraping portion.

BRUNNER'S ROAD SCRAPER.

The lever, I, being turned, operates the rock shaft, G, which, by the mechanism above described, raises the transverse bar, and with it the bars, B. By this means the man walking behind can throw the scrapers into or out of action at pleasure. Attached to the lever is a hooked rod which, catching in a projection on the rear axle, holds the lever down, and thereby keeps the bars raised when transporting the machine from place to place.

The advantages of this device, as a labor-saving invention, are sufficiently obvious to need no further description. It seems to be an implement in every way efficient and adapted to the wants of gardeners and those having private roadways to keep in order.

Patented through the Scientific American Patent Agency, October 8, 1872. For further particulars address the inventor, Michael M. Brunner, Superintendent, Rosedale Cemetery, Orange, N. J.

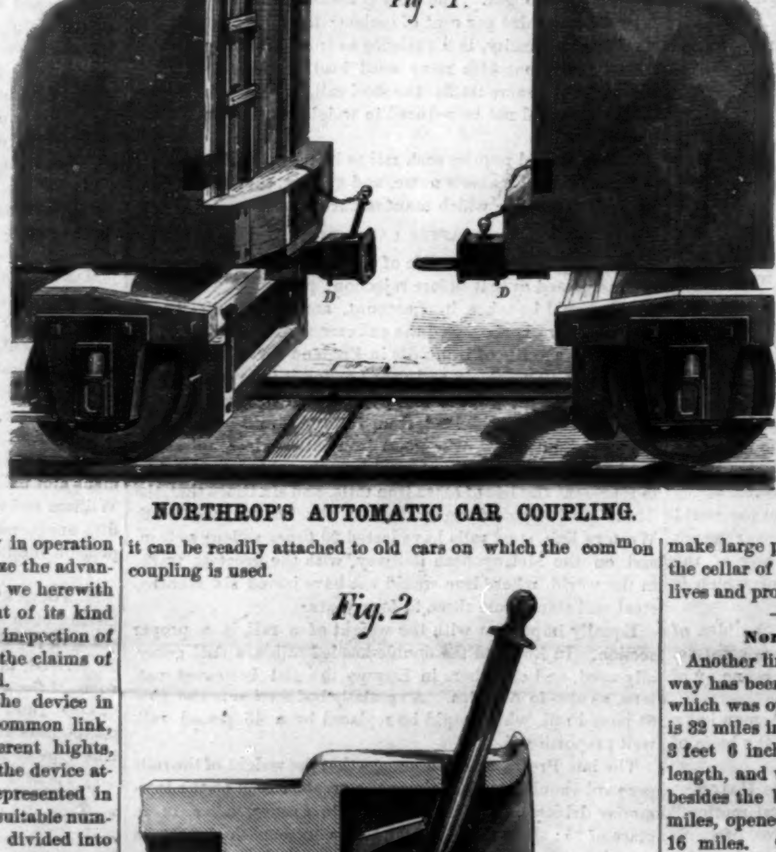
AUTOMATIC CAR COUPLING.

The principal objection which holds good against a large proportion of the automatic car couplings that have been devised is a want of simplicity, a multiplicity of parts which, by their expensive construction and difficulty in operation under disadvantageous circumstances, neutralize the advantages of the invention. The apparatus which we herewith illustrate, is the least complicated arrangement of its kind that has come under our notice, and, from an inspection of the working model, we are inclined to consider the claims of its inventor, as to its effectiveness, well founded.

In general appearance it is very similar to the device in ordinary use. The mode of connection is the common link, either straight or, if adapted for cars of different hights, goose-necked, and a simple pin. Fig. 1 shows the device attached to two freight cars, and in Fig. 2 it is represented in section. The bumper may be divided into any suitable number of compartments. In the present case it is divided into two by the partition, A. At the rear of the hole, in this partition, through which the coupling pin passes, is formed a recess, B, in which the end of the pin rests, as shown, and is thereby supported while the cars are being run together. C is a bent lever pivoted within the bumper at the rear of the partition, A. When the end of the coupling pin is placed in the recess, B, it pushes the upper arm of this lever back, swinging the lower arm forward. As the cars meet, the link enters the bottom compartment of the bumper, strikes against the lower arm of the lever, pushing it back, thereby causing the upper arm to move forward, strike against the pin, and push it out of the recess. The pin then naturally drops into its slot and through the link.

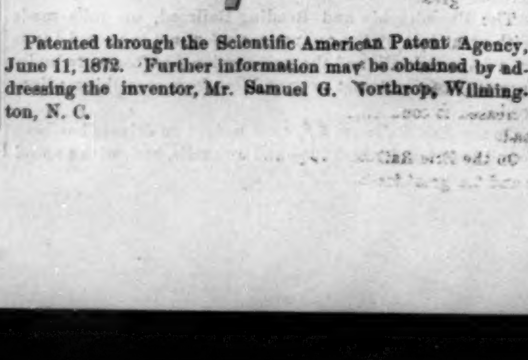
Fig. 1 is more especially designed to show the position of the device just before coupling, and also to indicate that the invention, with the exception of the downward projecting ends of the levers, D D, occupies no more space and, indeed, is hardly distinguishable from the old fashioned coupling. To uncouple freight cars, a chain may be carried from the pin to the roof, by which the pin can be easily withdrawn. One of the principal advantages of the apparatus, other than those already stated, is the facility with which it may be gradually introduced on a road, as new cars supplied with it can be readily attached to old cars on which the common coupling is used.

Fig. 1.



NORTHROP'S AUTOMATIC CAR COUPLING.

Fig. 2



Patented through the Scientific American Patent Agency, June 11, 1872. Further information may be obtained by addressing the inventor, Mr. Samuel G. Northrop, Wilmington, N. C.

Artificial Tortoiseshell.

According to the *Art Journal*, the appearance of tortoiseshell may be given to horn by brushing it over with a paste made of two parts of lime, one part of litharge, and a little soda lye, which is allowed to dry. This is the same as the Indian hair dye, and acts by forming sulphuret of lead with the sulphur contained in the albumen of the horn, producing dark spots, which contrast with the brighter color of the horn. Artificial tortoiseshell is made by melting gelatin with various metallic salts. The greatest comb manufactory in the world is in Aberdeen. There are thirty-six furnaces on the works for preparing horns and tortoiseshell for the combs, and no less than 120 iron screw presses worked by steam. Forty years ago ladies' back combs—which were larger than ladies' bonnets are now—were made in England and the United States for the Spanish Peninsula and South American markets. They were often a couple of feet wide, encircling two thirds of the head, and from six inches to one foot high on the back, the top being wrought in open work; to these the Spanish ladies attached their veils. As much of the work was done by hand and with the saw, and the polishing was entirely manual, the prices were high, averaging $15 to $20. Tortoiseshell was much used to decorate furniture by the Romans. According to Pliny, Carvillus Pollio was the first to apply tortoiseshell to ornamental purposes. The fashion for this style of decoration increased; and in the days of Augustus, the patricians ornamented their doors and the columns of their rooms with this substance. At one time tortoiseshell was used for making watch cases, but the art seems to have fallen in to desuetude, although the results of attempts to resuscitate it were shown at the London Exhibition last year.

Precautions in Using Gas Machines.

The following suggestions, for the use of gas machines in which light and inflammable hydrocarbons are employed, are from the instructions to insurance agents recently issued by the New York Board of Fire Underwriters:

The vault or house in which the gas is manufactured should be at least twenty-five feet distant from the main buildings. Stop cocks should be placed on both the gas and air pipes near the machine in the vault; also on the gas pipe near the place where it enters the building, and on the air pipe near the air pump, when the pump is in the cellar or building. The vent pipe and filling pipe must be so arranged that one cannot be opened without opening both. All the main gas pipes leading to the premises lighted should have an inclination toward the gas machine so as to return all the condensation that may take place in the pipes. The latter should be thoroughly tested before the gas is turned on. The vent should be open and the air pump shut off while filling the machine with fluid. Never allow a light to be used in or near a gas house or vault. No barrels containing gasolin or other fluid, or from which gasolin has recently been emptied (yet full of vapor) should be allowed to be kept in any cellar, barn, shed, or outbuilding where other property is stored, or where there is a liability to use a fire or a light. Great caution should be exercised in the selection of a trustworthy apparatus, and that a competent person be sent to put it up. There are many machines in the market made of poor material and in the cheapest possible manner, the manufacturers of which, by false representations, make large profits. Never allow a machine to be placed in the cellar of a dwelling, as it is apt to greatly endanger the lives and property of the occupants.

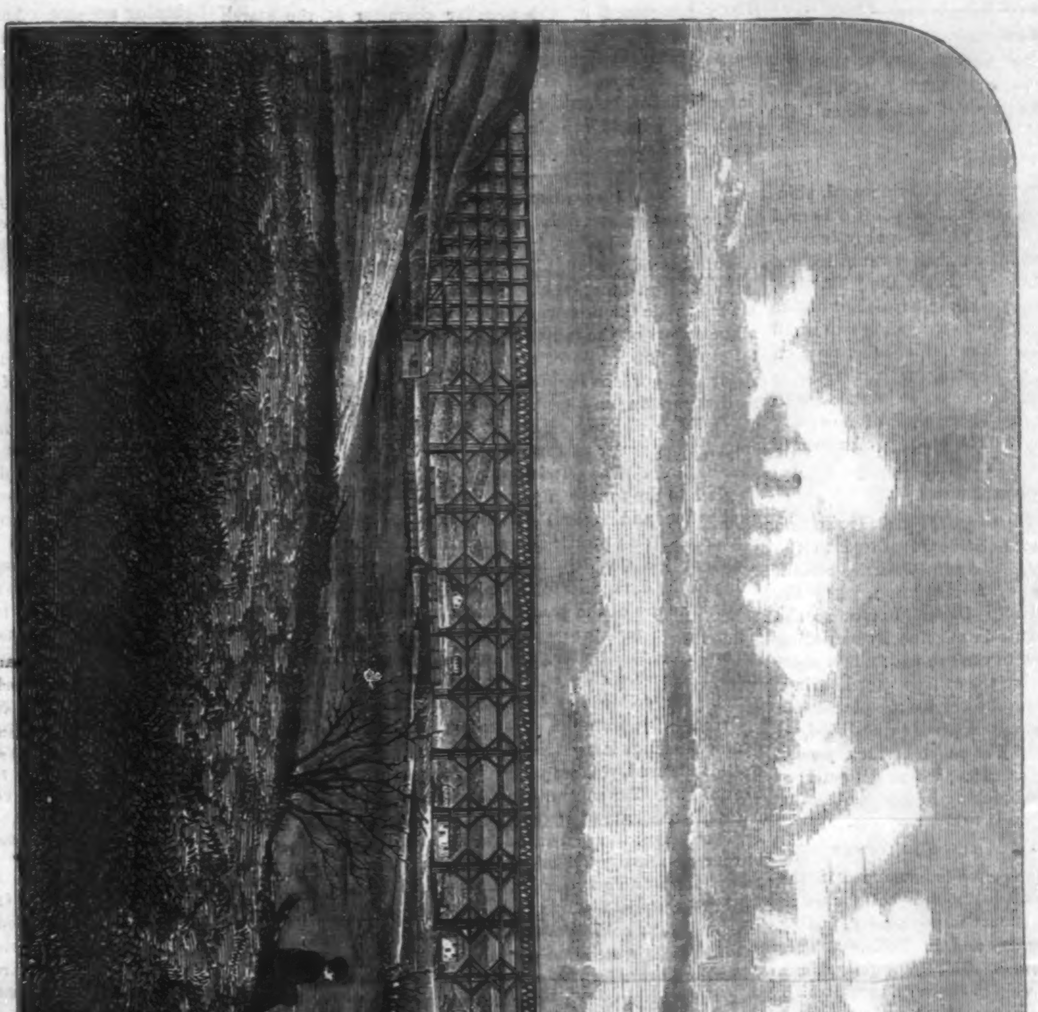
Norwegian Narrow Gage Railways.

Another link in the narrow gage railway system of Norway has been completed, in the Christiania-Drammen line, which was opened on the 7th of October last. This railway is 32 miles in length, and is connected at Drammen with the 3 feet 6 inch line, running to Handsfjorden, 56 miles in length, and with it making a continuous line 88 miles long, besides the branch to the silver mines at Rougsberg, 17¾ miles, opened in 1872, and another to the Lake of Krödem, 16 miles. Owing to the exceptional difficulties in construction, the Christiania-Drammen Railway has been the most expensive of all the narrow gage lines yet built in Norway. The total cost for the 32 miles was $35,000. For the whole of its length, the line runs through a most beautiful and picturesque country, and will command a large and yearly increasing tourist passenger traffic.

PROFESSOR CORNWALL, of Columbia College, N. Y., has, by means of the spectroscope, detected a notable amount of indium in various samples of zinc blende from New Hampshire and other States.

RAILWAY TIMBER BRIDGE.

Our engraving illustrates a timber bridge, constructed to carry the Southern Railway of Canada over Kettle Creek, at St. Thomas, Ontario. The work not only is an excellent example of type construction, but is remarkable for the rapidity with which it was completed. Its extreme length is 1,366 feet, divided into 736 feet of trestle work and 630 feet of house trussing; the latter is made up of 14 spans, resting upon timber piers. The extreme hight of the structure is 92 feet. There were used in its construction 1,070,672 feet of timber, board measure, 4,600 lineal feet of piling, about 35 tuns of wrought and 37 tuns of cast iron. The work was commenced on the 20th September, 1871, and completed the 13th February, 1872—a period of less than five months, and part of which lay in the severe season. Messrs. Dunn, Holmes, and Moore were the contractors, Mr. M. Courtright being the president of the railway, and Mr. M. N. Finney the engineer-in-chief.—*Engineering.*



TIMBER BRIDGE AT ST. THOMAS, ONTARIO.

French Prizes.

The Société d'Encouragement pour l'Industrie Nationale, of Paris, has published the programme of premiums and medals, to be awarded between the years 1873 and 1878.

The 2,000 franc prize (1873) for a steam launch 40 or 45 feet long working at 9 knots an hour in still water, and carrying sufficient fuel for 12 hours, working at maximum speed.

A prize of 3,000 francs (1876) for a steam engine of from 25 to 100 horse power, burning as a maximum in full work 700 grammes of coal per horse power per hour, weighing less than 300 kilogrammes (660 pounds), and costing from $60 to $100 per horse power. During trials the competitors will be at liberty to make use of any kind of fuel and system of generation which they prefer.

A prize of 1,000 francs (1873) for the best domestic engine, designed with the special object of assisting home work in towns.

A prize of 4,000 francs (1878) for progress made in the process of hemp and flax spinning. This prize will be awarded to the manufacturer who shall, on a production of more than 20,000 francs' worth of yarn, effect an economy of 15 per cent on the power employed, and a degree of fineness exceeding 150,000 feet per pound for the flax, and 20,000 feet for the hemp.

A prize of 2,000 francs (1874) for preparing fibers, hitherto subjected to carding.

A prize of 3,000 francs for a file cutting machine. The cutting tool of this machine to have a form mathematically true, to act without shock, and not to be liable to excessive repairs. The cost and maintenance of this machine, its production, and the driving power required, must be such that the results obtained offer sensible advantages over those obtained by hand work.

A prize of 5,000 francs (1873 to 1875) for a practical and cheap means of dressing millstones, so as to remove the existing dangers of this industry. This prize was founded by subscriptions made in La Ferté-sous-Jouarre.

In the chemical arts, prizes are proposed for the wholesale manufacture of oxygen and nitrogen, the utilization of waste materials, the production of graphite suitable for pencils, for a treatise on steel, based on certain experiments and having for its object improvement in the steel manufacture, and, lastly, for a process capable of disinfecting and clarifying, promptly and efficiently, the water of sewers, etc. Other prizes will be awarded for an electro-magnetic machine, for a system of heating houses and apartments, with constant circulation; for a process of meat preserving, for drying wood, for an industrial application of the spectral analysis, etc.

Among the agricultural prizes we may mention one of 6,000 francs for steam culture, and one for the best means of distributing powdered manure.

In the section of the Beaux Arts there are two entries, one (1874) for the manufacture of good photographic paper, the other (1873) for a process to produce photographic electrotypes which may be printed from in a common press, and used instead of wood engravings.

CEMENT FOR LEATHER.—Ten parts of carbon disulphide and one part oil of turpentine are mixed, and as much gutta percha added as will readily dissolve. The surfaces of leather must be freed, with a hot iron, from fat, and the parts once joined should be well pressed until they are firmly united.

RAILWAY PROGRESS IN 1872.

The Chicago *Railway Review* publishes carefully compiled statistics, showing the rapid progress that has been made in the construction of railways in the United States since the opening of the first 23 miles of the Baltimore and Ohio road in 1830. From the various portions of the statement showing the advance made in the past year, we extract the following interesting facts.

The number of miles added to all railways in 1872 was 7,925. It is estimated that at least 10,000 miles more of road are under construction and will be completed before the close of 1873. Progress was made on 353 roads. In Illinois 837½ miles, a distance greater than any other State, were finished. The total number of miles in that State on which work was done aggregated 1,401¼, the labor being distributed over 28 railroads. In New York construction was carried on over 1,338¼ miles, on 32 roads. The longest distance finished on any one line was on the Atcheson, Topeka, and Santa Fé road, in Kansas, 300 miles being laid during the past year. The progress in the States, Territories, and Provinces is as follows, estimating on the number of miles completed and in course of construction: Alabama, 209; Arkansas, 316: California, 560; Colorado, 317; Canada, 675; Connecticut, 53; Dakota, 65; Florida, 8½; Georgia, 138; Illinois, 140¼; Indiana, 394; Iowa, 913; Kansas, 773; Kentucky, 463; Louisiana, 106; Maine, 43; Massachusetts, 165; Maryland, 418; Michigan, 625; Minnesota, 942; Mississippi, 178; Missouri, 584; Nebraska, 233; New Hampshire, 162¾; New Jersey, 79½; New York, 1,338¼; North Carolina, 266; Ohio, 754¾; Oregon, 136; Pennsylvania, 732¼; Tennessee, 346; Texas, 637; Utah, 123; Vermont, 120; Virginia, 421; Wisconsin, 797. The aggregate tunnage of the roads has increased to nearly 200,000,000 annually. The increase in earnings has averaged about 25 per cent a year since 1851.

The past year will be especially noted as dating the beginning of the operation of narrow gage roads in the United States, as members of the railway system for general business. In the latter part of 1871, the first section of the Denver and Rio Grande road was completed and opened—76 miles from Denver to Colorado Springs—and it was maintained in efficient and economical operation during a winter of unprecedented severity. In the mountain regions of Colorado, the maximum paying gage has been fixed at 36 inches; and this has been adopted for the mountain extensions of the Colorado Central from Golden City, the terminus of the 4 feet 8½ inch gage line of the company. In Utah, also, the 36 inch gage is an accomplished fact. From Salt Lake City starts the Utah Southern, already completed (31 miles), connecting with the American Fork road, completed 17 miles; while to the north runs the Utah Northern, already finished for 25 miles. The Kansas Central has been built and opened for 50 miles. More important than the lines above named will be the opening of the Cairo and St. Louis road, extending over 150 miles, midway between the Illinois Central and the Mississippi river. From this road, the narrow gage system in the South may be said to derive almost its chief importance. A project is also on foot for the construction of a line from St. Louis into the heart of the South, east of the

Mississippi, the object of which is to bring the iron ore of Tennessee and the coal of Illinois together at a point favorable for manufacture. It is also understood that the narrow gage road, *via* Ripley, Tenn., to Mississippi city on the Gulf, will form a Cairo and St. Louis connection by way of Paris. This road has already 25 miles in operation. It should be added that a road is proposed to connect St. Louis with Kansas City and Leavenworth. An air line, narrow gage, is also proposed between St. Louis and the Atlantic seaboard. The total number of miles of narrow gage road completed and begun during the past year is 617.

COFFEE.

Mr. R. P. Hewitt, of this city, has recently published a well written and instructive volume, entitled "Coffee, its History and its Uses," from the pages of which we cull the following interesting facts:

THE COFFEE PLANT

is, in its native state, an evergreen shrub, having oval, shining, sharp pointed leaves, white, fragrant five-cleft clustered corollas, with projecting anthers and oblong, pulpy berries, which are at first of a bright red color but afterwards become purple. The flowers, which resemble those of the jessamine, fade very soon and are replaced by a kind of fruit not unlike a cherry, which contains a yellow fluid enveloping two small seeds or berries, convex upon one side, flat and furrowed on the other. These seeds are of a horny or cartilagenous nature; they are glued together, each being surrounded with a peculiar coriaceous membrane. The period of flowering does not last more than two days. The seeds are known to be ripe when the berries have a dark red color.

PREPARATION OF THE BEAN.

When the fruit is gathered, it is measured and thrown into a loft. Within twenty-four hours, it is submitted to the action of the pulping machinery. The pulped berries remain for a day and a night in process of fermentation, when the mucilaginous matter is washed off. In an hour or so the coffee is removed for curing. This is effected by spreading the beans in a thin layer exposed to the sun which, in a short time, absorbs all the water, leaving the coffee fit for housing. Milling is the next process. Here the berries are placed in a wooden trough and the parchment and silver skins dislodged by the friction of a large roller. The coffee is then passed through a fanner or winnowing machine, whence it emerges perfectly clean. Sizing and hand picking follow; and lastly, the produce is packed and forwarded to the markets.

CONSUMPTION OF THE VARIOUS KINDS OF COFFEE.

In the United States, Brazilian coffee is consumed in the greatest quantities, nearly 300,000,000 pounds being used in the year 1871. The Java berry is next in popularity, finding its principal markets in this country and in Holland. This variety of coffee improves by age. Old Government Java owes its fine flavor to the evaporation of the caffeic acid, which is the principle that imparts that harsh, bitter, and astringent taste which cannot be disguised. Coffee is also exported to this country from Maracaibo, La Guayra, Ceylon, San Domingo and other West India islands, Central America and Mexico.

METHODS OF MAKING COFFEE.

The roasting of coffee in the best manner requires great nicety, since much of the quality of the beverage depends upon the operation. It is usually roasted in a hollow cylinder made of perforated sheet iron, which is kept turning over a brisk fire. When the coffee has assumed a deep cinnamon color and an oily appearance, and the peculiar fragrance is perceived to be sufficiently strong, it should be taken from the fire, well shaken and permitted to cool. Not more than half a pound at once should be roasted for domestic use, and the cylinder should never be above one third filled. This operation and the subsequent grinding of the beans should be performed just before the coffee is needed for use. The French, who are celebrated for their coffee making, use various kinds in combination, such as Java, Mocha, Rio and Maracaibo. These coffees are so delicately and in such due proportions mixed as to produce a bouquet of aromatic flavors. With respect to quantity at least one ounce of coffee should be used to make three ordinary sized cupfulls. The coffee pot should be first warmed, and the water poured over the coffee. Whatever is used for clearing, white of eggs, isinglass, etc., should be dissolved before mixing.

There are about one hundred and seventy-five patents in existence for coffee pots. The best form known is one which distils the coffee, never allowing it to boil. By this process the infusion does not become black, bitter or stale, and can be served at any time, with all the aroma of the bean.

ADULTERATIONS.

The means resorted to for detecting adulterations in coffee are of three kinds, namely, certain physical characters and appearances presented by adulterated samples, the microscope, and chemistry. The first means consist in noticing whether the sample in the mass cakes or coheres, whether it floats in water or not, and the color of the infusion. If the ground coffee cakes in the paper in which it is folded, or when pressed between the fingers, there is good reason for believing that it is adulterated, most probably with chicory. If, when a few pinches of the suspected coffee are placed upon water in a wine glass, part floats and part sinks, there is reason to believe that it contains chicory, roasted corn or analogous substances. The coffee does not imbibe the water but floats on the surface, while the other materials absorb the water, and gradually subside to the bottom. Again, if the cold water to which a portion of ground coffee has been added, quickly becomes deeply colored, it is an evidence of the presence of some roasted vegetable substance or burnt sugar. If, when a few grains be spread upon a piece of glass and moistened with a few drops of water, soft particles like bread crumbs can be picked out with a needle, this is another proof of adulteration. Chicory communicates a reddish brown tint to water, which pure coffee scarcely tinges. The same substance may be readily detected under the microscope by the size, form and ready separation of the cells of the cellular tissue, by the presence and abundance of the dotted ducts and spiral vessels. Roasted corn can be similarly recognized by the peculiar character of the starch grains. Tincture of iodine instantly tells the presence of corn or beans by tinging the cold decoction a blue color.

So-called rye coffee should never be used. Apart from its inferior flavor, it has been found that a single mouthful of wholesome bread contains more nourishment than a dozen cups of a beverage made from roasted rye.

Phosphorescent Mixtures.

Phosphorescent tubes have been sold in France and Germany for several years, but the method of their preparation has not been divulged. Dr. Seelhorst, of Nuremburg, has been experimenting on the subject, and very considerately makes public the best way to secure mixtures that will afford all the colors of the rainbow and are capable of use in imitations of flowers, insects, and objects of natural history. After the powders are prepared, they can be stirred into melted paraffin; and by means of a brush, any pattern or design may be put upon glass. By protecting the glass in a frame, the powder will retain the property of glowing for a year or more. The putting of phosphorescent mixtures upon glass in the form of flowers is capable of very beautiful application, and is one that has not been very extensively practised. With proper care and study, a landscape could be drawn on glass which, after exposure to sunlight, would shine in the dark and form a picture of considerable duration. The use of the paraffin is to protect the powders from the action of moisture and prevent decomposition. As a general rule, it is better to hermetically seal the mixtures in flat bottles, when they will retain their good properties for years. The following colors can be obtained very readily:

Green.—Hyposulphite of strontia, heated for 15 minutes over a Berzelius lamp and for five minutes over a blast lamp until it is fused, yields a yellowish green color after exposure to sunlight. The same color can be obtained by taking equal parts of carbonate of strontia and *lac sulphuris*, heat gently for 5 minutes, then strongly for 25 minutes over a Bunsen burner, and finally five minutes over a blast. It is granular and yields a fine green color, darker than the preceding.

Blue.—Sulphate of strontia is prepared by precipitating with sulphuric acid from chloride of strontium the precipitate is dried, heated in a current of hydrogen gas, then over a Bunsen burner for 10 minutes and for 15 to 20 minutes over a blast lamp. The product sometimes yields a yellow phosphorescent light, and when this is the case, it is necessary to give it another turn over the blast lamp.

Yellow.—Sulphate of baryta 6 parts, charcoal 1 part, fused over a blast lamp, at first afforded no light, but after 24 hours gave an orange yellow light.

It may not be generally known that magnesium light will suffice to bring out all the effects of phosphorescence nearly as well as sunlight.

Pasteur's Method for Preserving Wine.

A great deal has been said and written about Pasteur's wine heating process, and it has been difficult to determine what value to put upon the testimony of those who have tried it. Professor Neubauer, of Wiesbaden, publishes a note of some experiments, conducted by himself, which deserve to be read with attention. He says that the tannic acid and extractive stuff of red wine precipitate most of the albuminous constituency of the wine, so that when the wine is heated it does not thicken or become milky. In his experiments, he carefully corked the wine and covered the corks with parchment paper, and warmed the bottles over a water bath, for half an hour, from 60° to 65° C. Bottles of wine of the same sort, heated and in natural condition, properly labelled, were stored in his cellar; and, on the occasion of the meeting of a club in Wiesbaden, numerous specimens were produced for trial. It was unanimously resolved at this meeting: "That the wine which had been heated was far superior, in odor, taste and ripeness, to the specimens taken from the cask." This decision of impartial witnesses, known to be good judges of wine, created such a sensation among wine growers that they immediately formed a company to purchase the necessary heating apparatus of the French manufacturers. The wine is in this way rapidly prepared for the market. It will bear transportation to warm climates, as was proved at the opening of the Suez Canal, on which occasion Pasteur's wine was preferred to all others. White wines have not been so thoroughly tested, and it is a question whether they are so much improved by heating as the clarets. Our American wine manufacturers ought to repeat these experiments.

A SOCIETY has been formed in England under the title of the National Health Society, which is to have for its object to help every man and woman, rich and poor, to know for himself, and to carry out practically around him, the best conditions of healthy living. The steps at present proposed are the holding of monthly meetings for the reading of papers; the establishing of classes for instruction in various branches of sanitary science; the delivery of free popular lectures; and the formation of a reference library and an information office.

Freaks of Electricity.

Mr. C. N. Simmons, electrician of the Western Union Telegraph Company, communicates to the Chicago *Inter-Ocean* the following account of the electrical phenomena which accompanied the great storm of January 7th and 8th: The disturbances were first noticed on the wires in central Iowa. The lines leading west were rendered useless for the transmission of messages, owing to an incessant discharge of electricity, increasing in intensity until it would leap from one strap of the switch board to another, across the intervening space and then, in a luminous stream, to the ground plate of the lightning arrester. Another singular fact observed was that, on some routes where a number of wires occupied the same poles, one wire alone was highly charged or so affected that to work it was an impossibility, while all the others were entirely free from any external influence. In some cases, the wire occupying the top of the pole would apparently receive the whole charge; in others, the bottom wire would be affected, and in a few cases the charge was equally distributed among all the wires In the Chicago office, the effect was similar to that observed in Iowa, and every observation confirmed the opinion that the center line of the storm was due east from Des Moines, Iowa, to Detroit, Mich., narrowing in its limits north and south as it approached the latter place where it arrived on the evening of the 8th ult., and rapidly subsided. A high wind varying from twenty-five to twenty-eight miles per hour accompanied the storm.

At the eastern slope of the Rocky Mountains, a similar phenomenon has been frequently witnessed upon a wire running north and south, but rarely on an east and west wire. Mr. Simmons ascribes it to the fact that, under the theory that the earth is charged with electricity negative to the atmosphere, there must be a point where discharge occurs or neutralization takes place. At points where the relative humidity of the air is very great, this is doubtless ever silently going on: but during seasons of intense cold, when the air is necessarily dry, the combination is evidently rendered more difficult and the tension thereby greatly augmented. If under these circumstances, good conductors such as telegraph wires are interposed, they would certainly assist in carrying a good part of the atmospheric charge to a point where the electrical tension was far less. What the electrical condition of the telegraph wires on the same pole was, to render one more susceptible than another to this inductive influence, or why wires running in other directions than east and west should not have been similarly affected, are problems yet unsolved. A recurrent storm, it is hoped, will afford an opportunity for more extended and accurate observations.

Electrotyping and Light.

We recently published an engraving and description of the new magneto-electric machine devised by M. Gramme. It consists briefly of a circular electro-magnet with poles consecutively turned before the magnetic poles of a magnet and the currents collected in a plane perpendicular to the poles. Without entering into any more extended explanation of the invention than that already published, as above indicated, we have now to note the results obtained in electrotypy and the production of light through the agency of this machine. M. Gramme states, in *Les Mondes*, that, at a rapidity of 275 turns, the instrument caused 8,101 grains of silver to be deposited in one hour, at 300 turns, 9,317 grains, and at 335 turns, 10,895 grains in a similar period. This last speed was too great, producing a heating of the coils which, if it had been continued, would have injured the machine.

A much larger apparatus was used for the production of light. Its hight was 4 feet and its weight about one ton. The wire rolled on the electro-magnets weighed 667 pounds and that of the three coils used, 195 pounds. With 300 revolutions per minute, expending about 4 horse power, M. Gramme obtained a light equal to that of 900 carcel burners, a more intense artificial illumination than has ever heretofore been produced by electro-magnetic agency. The calorific effects at the same speed of 300 turns were remarkable. A copper wire of 28 lines and one of iron of 52 lines in thickness, both 39 feet in length, were made red hot. The same iron wire in a length of 8 feet was completely melted.

Blue Color of the Sky.

M. Collas, of Paris, comments in *Les Mondes* of December 12, on M. A. Lallemande's paper on the blue color of the atmosphere, in which it was attributed to a change of refrangibility due to a partial absorption of the chemical or ultra violet rays. In 1870 M. Collas, in an article in *Les Mondes*, attributed the blue color of the Lake of Geneva and other waters to the quantity of silex held in solution, which is brought down by the tributary streams from the strata through which they pass. Numerous observations since have induced him to believe that the blue color of all the water of the globe is due to the same cause. The air everywhere always contains more or less of moisture due to evaporation from the water of the earth; the water thus evaporated always contains a greater or less quantity of extremely fine insoluble particles. Silex, says M. Collas, is one of the most common insoluble substances in nature, and, through evaporation, performs the same function in the blue sky that he believes it does in the blue waters of the earth. He believes his theory is confirmed by the intense blue of southern skies, where evaporation is so much greater than in the colder north.

THE Berlin Geographical Society has opened subscriptions for the contemplated Congo expedition. Dr. Güssfield, the glacier explorer, who is to be the leader of the enterprise, has himself contributed nearly $5000, and there is every prospect that the full amount necessary will be forthcoming.

PATENT OFFICE DECISIONS.

TABLET FOR CLOCK FRONT ORNAMENTATION.—SAMUEL B. JEROME.—APPEAL.

LEGGETT, *Commissioner:*

Applicant says his invention consists in making an ornamental tablet for a clock front by "applying paper, upon which the illustration or ornamentation is first made, to the back of a piece of glass, the paper first being moistened, then the edges turned over, and glued or otherwise secured to the front or outer surface of the glass, so that when the moistened paper dries it will shrink tight down upon the glass, giving it the same appearance as when the painting is made directly upon the glass."

The references cited by the Examiner are in point. In every picture store will be found engravings attached to the backs of pieces of glass in this way, and it has been done no one knows how long. This is the "article" claimed, no matter to what use it may be applied.

Patent refused.

BEVEL SQUARES.—FAIRBANKS AND ROBINSON.—APPEAL.

LEGGETT, *Commissioner:*

Applicant seeks to secure a monopoly of bevel squares having two blades one of which may be set at right angles while the other is left free to move. In other words, he asks for an exclusive property in a certain general plan of construction of squares, without reference to any particular mechanism by means of which it is embodied. If his claim could be allowed, and could be sustained in court, it would prevent all improvement of this class of squares. All invention would be repressed by a monopoly of the broad idea or principle of construction. It is possible applicant has invented only an imperfect means of adjusting and securing his blades. It is desirable that no obstacle shall stand in the way of the production of the best means. But if applicant has produced the best means, then by claiming only the parts and combinations, he actually shows he will be amply protected. In any event, these are all he can lawfully secure.

The decision of the Board is affirmed.

Facts for the Ladies.—Mrs. M. G. Phillips, Fort Ann, N. Y., has had a Wheeler & Wilson Lock-Stitch Machine since 1864, doing shirt work and family sewing, without repairs, and it is now in good working order. See the new Improvements and Woods' Lock-Stitch Ripper.

Recent American and Foreign Patents.

Improved Automatic Fan.

William Lawrence and Joseph Sanders, New Albany, Ind.—This invention has reference to a class of fans which are made to operate automatically by means of clockwork or similar motive power, and consists in the construction and arrangement of parts, whereby the fan is made portable so that it can be readily moved from place to place, and made adjustable by elevating or depressing so as to throw the current of air in any particular direction.

Improved Coal-breaking Machine.

Rufus A. Wilder, Cressona, Penn.—This invention relates to a new machine for breaking and assorting coal, and has for its object to obtain, as near as practicable, a clean fracture in breaking, and avoid thereby the prolific production of waste or coal dust. The invention consists in the construction of a horizontal centrifugal machine whose rotary breaking plate has projecting teeth or cutters that reduce the coal while the same rests against stationary breaking plates. The rotary breaking plate is perforated to enable the reduced coal to pass through its meshes upon a rotary disk, from which the larger pieces are by centrifugal force thrown into a chute, the smaller passing through a stationary raker, and then off the edges of the disk, and the smallest through the meshes of the disk, which is also perforated.

Machine for Making Plaited and Puffed Trimmings.

Wellwood Murray, New York city.—This invention consists of a pair of intermittingly rotating rollers, either with or without puffing teeth or cogs, combined with a pair of folding blades or knives in such manner that a strip of cloth will be plaited on each border with a row of puffs between, the plates of each slide being reversed as to each other.

Improved Steam Pumping Engine.

James H. McConnell, Harmar, Ohio.—This invention relates to new and useful improvements in steam pumping engines, and consists in the box valve having lugs and movable over the seat, combined with a valve having a neck, so that the main valve is actuated by steam admitted thereto by the action of slide valve, and so that, if the steam should fail to give the requisite throw to main valve, that effect will be insured by the action of the neck upon lugs, and the grooves in the sides of the valve seat, and the orifices, through the same, for permitting any steam to escape in case the valve should leak so that it will not interfere with the proper working of the valve.

Paste for Making Stereotype Molds.

Samuel Crump, New York city.—This invention consists in mixing asbestos, in large or small proportions, with the paste which is used in making *papier mache* stereotype molds. It is proposed to fill in the cavities in the back of the matrix, which have hitherto been partly filled with pasteboard in order to obtain the requisite stiffness, entirely with this paste, so that, with the pasting of the sheets together, the paper will be largely saturated with the paste, which, by virtue of the asbestos contained in it, renders the molds, to a certain extent, fireproof, so that a greater number of casts of the molten metal can be taken from one mold or matrix than can be taken from the ordinary molds.

Improved Hand Weeder.

Henry B. Sherwood, Westport, Conn.—The blade of the weeder is a thin and narrow steel plate, the side and end edges of which are beveled off upon their lower sides. The ends of the blade are slightly curved upward. This construction enables either end of the blade to be used as may be convenient for removing weeds growing between or close to the sides of the plants, and enables the weeder to be used for loosening the soil close to the plants without danger of cutting off or injuring said plants. Two shanks also serve to break up and loosen the soil when the blade is moved along laterally beneath its surface.

Improved Pianoforte Hammer Head.

John Shaudelle, Courtland, Ala.—This invention has for its object to produce a pianoforte hammer head which shall present a thin and elastic surface to the string and retain its original elasticity after long and constant use; and the invention consists in the construction of the hammer head of india rubber provided with an opening near its tip or striking surface. The opening near the tip of the hammer head presenting a thin and elastic surface to the string, the hammer retains its original elasticity after long and constant use. The strings of the piano are saved from wear by reason of the perpetual softness of the hammer head. There is economy in both hammers and strings, as the latter are not worn out, and there is no necessity for a new hammer to develop a soft, gentle tone. See advertisement in another column.

Improved Compound for Fish Baits.

Samuel Adams Goodman, Jr., Jamestown, Texas.—This invention consists of a compound of the following substances as a mixture to be applied to the ordinary bait for fish, or to the net, by which the bait is rendered more tempting to the fish, and they will be attracted into the net: Oil of anise, assafœtida, cardamom seed, either golden, yellow, or black root, and buzzard meat, all except the latter being in equal parts, and the root and cardamom seed being powdered fine and mixed together in a vial, a small piece only of the buzzard meat (fresh) being put in; the whole being then shaken well together and allowed to stand about twenty-four hours, when it will be ready for use. The mixture should be shaken well each time before using. It is used by dropping a few drops on the ordinary bait after being applied to the hook; or in case of fishing with nets, it is dropped on the net. If the mixture is to be preserved for any considerable length of time the buzzard meat may be omitted until the time of using, as it will not keep so well as the other ingredients. The scientific name of the black root, alluded to above, is Leptandra; that of the golden or yellow root is Hydrastis Canadensis; and the kind of buzzard used is the one known as the turkey buzzard.

Improved Chalk Holder for Billiards.

Richard H. Thomas, of Kid's Grove, near Stoke-on-Trent, Eng., now residing at Newport, Ky.—This invention consists of a hollow cylinder with a detachable cap at one end adapted to hold a cylinder of chalk and admit the end of the cue to be chalked by bearing the chalk against it and revolving the holder by the fingers. The cap is large enough to receive one end of the cylinder, which is somewhat reduced to fit snugly in it, and is fastened to the cylinder by a pin and spring, which also fasten the piece of chalk in the holder, the pin projecting through it into the chalk. The cap may also screw on the cylinder if preferred.

Improved Compound for Cure of Toothache.

Francis J. Oswald, New York city.—This compound for the cure of toothache consists of essence of bergamot, essence of citron, essence of lavender, essence of romaine, essence of neroli, mixed in alcohol.

Improved Whiffletree and Trace.

Robert R. R. Stewart, River Vale, Ind.—This invention has for its object to avoid injury to field plants by the projecting ends of singletrees or whiffletrees of agricultural machines. The invention consists in so constructing the whiffletrees or singletrees that the traces when attached thereto will be flush with their ends.

Improved Fruit Crate.

Humphrey Humphreys and Eugene W. Humphreys, Salisbury, Md.—The object of this invention is to provide practical and economical means for transporting berries and other tender fruit in small boxes or baskets which are packed into crates. The invention consists in combining and constructing the parts of a crate so that the contents of the basket are kept cool by the air, which freely circulates through the open crate and around and over the baskets.

Improved Music Leaf Turner.

George Robb, McDonald, Pa.—This invention relates to a new attachment to pianofortes, melodeons or organs, for turning over leaves of music by means of pedals, and without necessitating the use of the hands for that purpose. The invention consists in the arrangement and connection with each other of a series of vibrating arms by which the music is turned and held in any desired position. Thin rods connect with pedals, so that the player may, by means of said pedals, cause the vibrating frames or arms to be swung in either direction, thus attaining full control over the music, which may be swung back and forward at pleasure.

Improved Refrigerator.

William M. Baker, Fortville, Ind.—This invention relates to a new construction of refrigerator or ice box, with the object of utilizing the coldness of the ice water in the preservation of the contents and in obtaining a draft of cooled air. The invention consists in a novel arrangement of air and water passages, which cause the air that enters the refrigerator to become cooled and remain dry, and the water to cool the air passages and sides of the refrigerator.

Improved Band Tuck for Grain Binders.

John Beall, Defiance, O.—This invention consists of a stick of wood or metal suitable for tucking the twist of the grain band under, suspended from the wrist by a strap, and from a thumb sack a little in advance of where it is suspended from the wrist in such a manner that it will not interfere with the legitimate operations of the hand in forming, applying, and twisting the band, but will be ready at hand for grasping quickly to tuck the twist under and save the tucking of it by the fingers, which is very trying to them. The thumb sack is secured on the thumb by the wrist band of the tucker, which goes through the upper end of the sack for that purpose.

Improved Thread Waxing Attachment for Sewing Machines.

Clay E. Lewis, York, Pa.—The invention consists in a heater, arranged for heating the horn and waxing attachment. With an attachment of this character the thread is only waxed as the work progresses, so that none is lost by the wax becoming too hard by long standing, as is the case when large bobbins of waxed thread are prepared beforehand.

Improved Fly Trap.

This ingenious little device is the invention of Mr. Perry A. Burgess, of Butler, Mo., and is an improvement on the simple and well known method of fly catching, by covering a tumbler with a piece of bread covered with molasses on its under side, and pierced with a hole in the middle. The present contrivance is a flanged disk of tin, wood or other suitable material with a central hole and an interior recess underneath filled with soft leather, felt or other absorbent substance. It is placed on a tumbler, the vessel being previously filled with soap suds. The absorbent is smeared with molasses. Attracted by the latter, the unsuspecting fly enters the central hole, but on reaching the object of his desire meets with destruction by tumbling off into the soap suds below. The device is manifestly simple and consequently cheap, and is undoubtedly efficient. Patented through the Scientific American Patent Agency, April 30, 1872. For further particulars see advertising page 124.

Improved Machine for Twisting Oakum.

Lewis Howard and Charles Howard, Watkins, N.Y.—The invention consists in combining a rotary tube, a spring fingered tube, guides and drawing rolls so as to twist and shape crude tow into ropes. By the use of this improvement the material is twisted with great rapidity and nicety, effecting also much saving in manual labor.

Improved Cultivator.

James Sherrill, Harrisburg, Oregon.—This invention has for its object to furnish an improved seed sower and cultivator. The wheels revolve upon the axles of the axle tree, to which the stationary frame is attached. The tongue is attached to the frame and may be placed at the center of said frame or toward one side, as may be desired, according to the number of horses to be used abreast. To the forward part or angle of a triangular frame, the draft clevis is attached. The frame consists of a number of parallel bars of different lengths, connected by cross bars, and is so arranged that the carriage may be drawn from it. The plow beams are of different lengths, four longer and three shorter, arranged alternately. The forward ends of the plow beams are placed between the rear ends of the parallel bars of the frame, and are prevented from having any lateral play while allowing the rear parts of the said beams to have a free vertical movement. The seed box is attached to the frame directly over the axle. In the bottom of the seed box is formed a series of holes, which are arranged directly over the plow beams, so that the seed in falling may strike upon said beams and be thoroughly scattered. A shaft extends longitudinally through the seed box and revolves in bearings in the ends of the said box. Upon the projecting end of the shaft is placed a small gear wheel, which is connected with said shaft by a tongue and groove or other suitable means, so that it may carry the said shaft with it in its revolution, but may slide freely upon the said shaft to be thrown into and out of gear with a large gear wheel when desired. A rod passes through a keeper attached to the rear side of the seed box near its end. The outer end of the rod is bent forward, and is forked to receive the gear wheel and serve as a clutch for moving the said gear wheel into and out of gear. The said gear wheel may be removed from the shaft when the dropping device is not required to be used. A sliding plate is placed upon the under side of the bottom of the seed box, and is slotted longitudinally beneath each discharge opening. By adjusting the said sliding plate the size of the discharge openings may be readily adjusted, according as less or more seed is required to be sown. The depth to which the plows enter the ground may also be limited by bars, and the forward ends of the plow beams may be raised and lowered as may be desired.

Improved Crimping and Fluting Machine.

Robert Werner, Hoboken, N. J.—This invention relates to a new machine for producing a fluted and crimped fabric, substantially like that for which a design patent was granted on the 29th day of November, 1870, from a smooth and flat woven fabric; and the invention consists, principally, in the application to fluting rollers of a detent or finger by which a portion of the fabric is held back, and thereby formed into V-shaped, but more or less irregular, lateral waves or crinkles, whereby the stated and desired effect is produced. This finger is made to bear against a platform over which the fabric is passed to the fluting rollers, or directly against one of the rollers, as may be desired. The invention also consists in a new arrangement and connection, with said fluting rollers, of a device for holding the fluted fabric in contact with the same while the crinkled portion of the fabric is being elevated and puffed up by a projecting rib or stationary plate.

Improved Caster for Furniture.

Cevedra B. Sheldon, New York city.—This invention relates to the construction of casters for pianos, household furniture, and other purposes; and consists in a cup or block, which is enclosed by the shell of the caster, with an annular groove adapted to receive and confine a series of balls, whose function is to bear upon the main ball or roller and thus reduce friction.

Improved Billiard Register.

Marion McKay, Topeka, Kansas.—This invention has for its object to produce a double register, in which one side will not count game if the other side has won the game immediately preceding. The invention consists in so connecting the pawl by which the game counting arbor is turned with a movable bar, and in combining it with projecting pins on the point counting shaft and with a vibrating frame, so that whenever the point counting index on one side has completed a revolution the game counting pawl on the other side will be thrown out of gear, not to operate at the end of the same game. All possible confusion is thus prevented, and none but the winning games will be recorded.

Improved Railway Snow Plow.

Samuel W. Hemenway, Lansing, Iowa.—This invention consists of fan blowers with suction and discharge pipes, combined with the scraper sides, having holes to allow the snow to be conducted into the suction pipes, to be taken up by the air blasts and discharged over the side of the way, all in such manner that the snow may be taken from the front and discharged over the bank at the side.

Improved Excavator.

Samuel B. Alger, Oswego, N. Y.—This invention has for its object to furnish an improved excavator or self dumping cart, which shall be so constructed as to raise the dirt and discharge it into the cart. The wheels are made with deep rims, to the inner sides of which are attached the buckets or elevators which receive or take up the dirt and discharge it into the box. The elevators are made with hinged bottoms which are held in place by springs, so that, should the elevators strike a stone, the hinged backs may yield and the elevator pass on without being broken. The box is made in the form of a hollow cylinder with a portion cut away, and is rigidly attached to the axle. The buckets or excavators are made with open inner sides and move close to the curved outer surface of the box until they pass above the open part of the said box, when the dirt falls into the box. Levers are so arranged upon the axle that, when the box is in position to receive the dirt, they may project forward along the outer side of the forward part of the arms of the draft bail, so that they may be secured in place, holding the box in position to receive the dirt. When the box is full, and the cart has been drawn to the place where the dirt is to be dumped, the locking pins are removed. As the cart is started forward, the wheels in their revolution carry the levers and the box with them, dumping the dirt. When the wheels have made half a revolution, and the open side of the box is directed downward, it is held inverted until the dirt has all passed out. The pins are then removed, when the weight of the box brings it and the levers back into their former position.

Conveyor and Separator for Coal Breaking Machines.

Rufus A. Wilder, Cressona, Pa.—This invention relates to a new machine for conveying coal from one breaking machine to another in reducing it to different sizes, and for taking out any required size or sizes between the breakers while so conveying the coal; also, for distributing the different kinds of coal to the several chutes or pockets that hold it. The invention consists, principally, in the arrangement of an endless rotary wire screen between two coal breaking machines, and in the combination, with said screen, of a notched or slotted separator, which will remove any desired grade from the coal that is being conveyed on the screen from one breaker to the other.

Improved Hose Coupling.

John T. Condon, New Orleans, La., and Frank Jeffers, Pawtucket, R. I.—The hose is received in a tube at one end and is compressed by a cut ring and band nut. The connection at the opposite end is similar, but the tube is separate from the coupling and inserted in the hose. This tube is tapering, and the hose is compressed upon it by means of the ring, which is drawn up on to the hose by the band nut. This nut screws into the coupling and draws the ring by means of the shoulders on its inner surface. The inner surface of the ring is formed with projecting beads. The two parts are coupled together by means of a loose band made in two semicircles, connected and fastened together by tubular caps. On the inner surface of this band is a projecting rib or flange. Longitudinal slots are made in the part of the coupling which cuts through the groove which receives the rib. The rib itself has openings at two points to correspond with these slots. The parts of the coupling are merely clapped together, and the band is turned. When the openings in the rib correspond with the slots, the lugs enter, and then the band is turned, which completes the operation.

Improved Car Coupling.

Charles Gallagher, Taunton, Mass.—This invention has for its object to furnish an improved car coupling which shall be so constructed as to couple the cars automatically as they are run together, and which may be uncoupled from the platform, top, or side of the cars; and it consists in the hooks, made with curved inner ends provided with coiled springs and cords or chains, and arranged to operate in connection with the recessed bumper heads.

Improved Sash Holder.

John R. Adams, West Galway, assignor to himself and Frank F. Carnduff, Amsterdam, N. Y.—This invention is an improvement in the class of sash holders consisting essentially of two cam faced levers acted on by an intermediately arranged spring. By suitable construction any attempt to raise the window sash from any position in which it may be will cause an upper wheel to be pressed against the casing with a pressure increasing with a force proportioned to the force applied to the window sash. In the same way any attempt to lower the window will cause a lower wheel to hug the casing. A spring holds both wheels in a position to operate if there is any attempt to move the sash. By pressing thumb pieces toward each other, the wheels will both be turned so as to present their shortest radius toward the casing, allowing the sash to be moved up or down freely.

Improved Boring Machine.

James W. Shaw, Wenona, Mich.—This invention relates to a new machine for boring holes in the ends of logs and other pieces of long timber, in order to make them up into rafts, which is done by stringing chains through them. The machine is secured upon two or more logs, which form a float and leave a space of about four feet in width between them, directly under the auger. At each end of the float is a curved iron rod which connects the logs, in order to keep them in place. The machine is placed in position and the floating logs to be bored are run under the machine, turned one quarter over, and secured thus by means of dogs, one of which is attached to the float, and the other, a double one, attached to the machine, directly in front of the auger, and driven into the end of the log to be bored. While the auger is being turned it is slowly fed down by turning segments or pinions by a crank handle.

NEW BOOKS AND PUBLICATIONS.

TREATISE ON THE THEORY OF THE CONSTRUCTION OF BRIDGES AND ROOFS. By De Volson Wood, Professor of Mathematics and Mechanics in the Stevens Institute of Technology. Illustrated. New York: John Wiley & Son, Publishers, 15 Astor Place.

This book contains the substance of the lectures delivered by Professor Wood, upon trussed bridges and roofs, before the senior class in the University of Michigan. The well known reputation of the author is a sufficient guarantee of the excellence of the work and its reliability as a text book upon the subject to which it is devoted.

MESSRS. BRIGGS & BROTHER, seed dealers of Rochester, N.Y., publish a very beautifully illustrated quarterly, the first number of which we have recently received. Besides a catalogue of seeds, plants, etc., furnished by the firm, the book contains several finely finished chromos of flowers, together with much useful information on horticultural subjects. The four issues for 1873 are offered at the low price of 25 cents for all, or the work is sent free to parties ordering seeds to the value of $1.25.

Inventions Patented in England by Americans.

[Compiled from the Commissioners of Patents' Journal.]

From January 11 to January 16, 1873, inclusive.

ROLLING METALS, ETC.—C. H. Perkins, Providence, R. I.
SCHOOL DESK AND SEAT.—A. H. Andrews, Chicago, Ill.
SPINNING MACHINERY.—J. W. Wattles, Mass.
STOVE PIPES, ELBOWS, ETC.—A. G. Myers, New York city.
VELOCIPEDE, ETC.—G. Avery, Ottawa, Ill

Business and Personal.

The Charge for Insertion under this head is $1 a Line.

Business Agency in Boston wanted, by an energetic man; references unquestionably first class; good social position; extensive business acquaintance in N. E. States. Address "King," P. O. Box 1266, Boston, Mass.

Piano Forte Improvement—The subscriber has just patented a new pianoforte hammer, which he believes to be the best invention of the kind ever invented. See notice of the invention in another column. Address, for rights, John Shandelle, Courtland, Ala.

For Sale—One half or whole of Steam Saw Mill, 40 Horse Engine. Timber, $6 per M.; Seneca Lumber, $20 to $25 per M. Just put up in City. Apply D. Riker, Charleston, S. C.

Buy Gear's Improved Balanced Jig Saw, Boston, Mass.

Five different sizes of Gatling Guns are now manufactured at Colt's Armory, Hartford, Conn. The larger sizes have a range of over two miles. These arms are indispensable in modern warfare.

Machinist Wanted—To erect work outside. To competent men, constant work and good pay. Apply by letter to Watts, Campbell & Co., Newark, N. J.

See advertisement of Brady & Logan, p. 124.

Water Front, also Stores or Lots to Rent, Delancy St., E. River. Andrews Bro., 414 Water St., N. Y.

Covering for Boilers and Pipes. The most economical and durable article in use. Took first prize at American Institute Fair. Van Tuyl Manufacturing Company, 328 Water Street, New York.

The Berryman Manuf. Co. make a specialty of the economy and safety in working Steam Boilers. I. B. Davis & Co., Hartford, Conn.

Indispensable to every Manufacturer and Machinists—Boston Journal of Commerce; send for a specimen copy. $3 per year.

Carpenters—For Sale, a Sash Factory, run by water power, at a lumber landing, with a profitable run of trade. For particulars, address P. O. Box No. 2, Charlestown, Jefferson County, West Virginia.

Buy Steam Engines and Boilers of Gear, Boston, Mass.

Mining, Wrecking, Pumping, Drainage, or Irrigating Machinery, for sale or rent. See advertisement, Andrew's Patent, inside page.

Needle and Clock Machinery of every description of the most Improved Styles. Hendey Bro's, Wolcottville, Ct.

For best Presses, Dies and Fruit Can Tools, Bliss & Williams, 118 to 120 Plymouth St., Brooklyn, N.Y.

Hammer Dies and Heads, strong and durable, cast to order by Pittsburgh Steel Casting Co. All work warranted.

For 2, 4, 6 & 8 H. P. Engines, address Twiss Bro., New Haven, Conn.

Peck's Patent Drop Press. Milo Peck & Co., New Haven, Conn.

Diamond Carbon, of all sizes and shapes, furnished for drilling rock, sawing stone, and turning emery wheels or other hard substances, also Glazier's Diamonds, by John Dickinson, 64 Nassau St., New York.

A Superior Printing Telegraph Instrument (the Selden Patent), for private and short lines—awarded the First Premium (a Silver Medal) at Cincinnati Exposition, 1872, for "Best Telegraph Instrument for private use"—is offered for sale by the Mercht's M'f'g and Construction Co., 50 Broad St., New York. P. O. Box 6865.

Iron Roofing. Scott & Co., Cincinnati, Ohio.

Shafting and Pulleys a specialty. Small orders filled on as good terms as large. D. Frisbie & Co., New Haven, Conn.

Hydraulic Presses and Jacks, new and second hand. E. Lyon, 470 Grand Street, New York.

For Wait's Improved Turbine Water Wheels, Improved Mulay, Gang, and Circular Saw Mills, Paper Engines, Rope Cutters, &c. &c., address Marlhew & Van Wormer, Successors to P. H. Wait, Sandy Hill, N. Y.

Circular Saw Mills, with Lane's Patent Sets; more than 1200 in operation. Send for descriptive pamphlet and price list. Lane, Pitkin & Brock, Montpelier, Vermont.

Machinists—Price List of small Tools free; Gear Wheels for Models, Price List free; Chucks and Drills, Price List free. Goodnow & Wightman, 23 Cornhill, Boston, Mass.

All Fruit-can Tools, Ferracute, Bridgeton, N.J.

English Patent—The Proprietors of the "Heald & Cisco Centrifugal Pump" (triumphant at the recent Fairs), having their hands full at home, will sell their Patent for Great Britain, just obtained. A great chance for business in England. Address Heald, Sisco & Co., Baldwinsville, N. Y.

Read the article on "The Machinists," now being published in the Boston Journal of Commerce. Send for Specimen Copy.

American Boiler Powder, for certainty, safety, and cheapness, "The Standard anti-incrustant." Am. B. P. Co., Box 797, Pittsburgh, Pa.

Scale in Boilers. I will Remove and prevent Scale in any Steam Boiler, or make no charge. Send for circular. Geo. W. Lord, Philadelphia, Pa.

Gauges, for Locomotives, Steam, Vacuum, Air, and Testing purposes—Time and Automatic Recording Gauges—Engine Counters, Rate Gauges, and Test Pumps. All kinds fine brass work done by The Recording Steam Gauge Company, 91 Liberty Street, New York.

Boynton's Lightning Saws. The genuine $500 challenge. Will cut five times as fast as an ax. A six foot cross cut and buck saw, $6. E. M. Boynton, 80 Beekman Street, New York, Sole Proprietor.

Absolutely the best protection against Fire—Babcock Extinguisher. F. W. Farwell, Secretary, 407 Broadway, New York.

Steel Castings "To Pattern," from ten lbs. upward, can be forged and tempered. Address Collins & Co., No. 212 Water St., N. Y.

The Berryman Steam Trap excels all others. The best is always the cheapest. Address I. B. Davis & Co., Hartford, Conn.

All Blacksmith Shops need a Holding Vise to upset bolts by hand. For such address J. R. Abbe, Manchester, N. H.

Williamson's Road Steamer and Steam Plow, with rubber Tires. Address D. D. Williamson, 32 Broadway, N. Y., or Box 1809.

For Steam Fire Engines, address R. J. Gould, Newark, N. J.

Brown's Coalyard Quarry & Contractors' Apparatus for hoisting and conveying material by iron cable, W.D. Andrews & Bro. 414 Water st. N. Y.

Always right side up—The Olmsted Oiler, enlarged and improved. Sold everywhere.

Belting as is Belting—Best Philadelphia Oak Tanned. C. W. Arny, 301 and 303 Cherry Street, Philadelphia, Pa.

For Solid Wrought-iron Beams, etc., see advertisement. Address Union Iron Mills, Pittsburgh, Pa., for lithograph, etc.

The Berryman Heater and Regulator for Steam Boilers—No one using Steam Boilers can afford to be without them. I. B. Davis & Co.

Notes & Queries

1.—S. E. P. asks for simple directions for galvanizing cast iron.

2.—T. G. S. asks for a formula for preparing unalterable sirup of iodide of iron.

3.—H. M. H. asks how to make and apply a polish on articles made of manyanita wood.

4.—T. C. M. asks how to gild on marble, so that occasional washings will not injure the gilding?

5.—F. S. S. asks how to give tempered steel spectacle frames that beautiful even blue color, given to fine English steel spectacles. Should the frames be baked in a small furnace, and, if so, at what temperature?

6.—S. F. S. asks: How can a barn be ventilated so that it will not smell strong? It is 22x40 feet on the floor, 10 feet to the upper floor, and 17½ feet from there to the peak of the roof. There are no buildings on three sides of it. I tried disinfecting it with chloride of lime, but it takes too much and does not have the desired effect.

7.—E. F. asks for a recipe for a hair dye that is not permanent, that is, one which will disappear on the application of soap and water, ammonia, or some cheap chemical.

8.—E. F. wants a rule for rating or calculating the horse power of steam boilers, and the pressure per square inch a boiler of any given dimensions and thickness of iron is expected to bear.

9.—W. H. P. asks: In sawing off a board twenty-four inches wide, which requires the greatest power, one saw that cut just 24 inches, or two saws that cut just 12 inches each, one above the other? The saws are to be of the same gage.

10.—L. F. S. asks: Why is it that some manufacturers of machinery and other goods, in the face of all competition, maintain such excessively high prices for their productions, preferring, as it seems, to sell perhaps a sixth or a quarter of what they might rather than to reduce their prices?

11.—J. J. C. asks what material he should use for a double scull boat made for speed and durability. Of what dimensions ought it to be? Is cloth made waterproof also airproof? If not, what should I use to make it airproof

12.—R. asks what is the cheapest and quickest artificial process for seasoning timber for staves, etc. Of what material should a kiln 14x30x6 feet be constructed? How should it be heated so as to give a temperature of 115° Fah. and to season the staves in 4 days? I do not want the smoke or sparks to circulate among the staves.

13.—J. F. P. asks: How can I work aluminum bronze, so that it will be malleable and soft enough to roll or be drawn into wire? After repeated trials of melting together 10 parts aluminum and 90 parts rolled copper, I have failed; it pours and sticks to the crucible like pudding, and is as brittle as cast iron.

14.—N. H. says: I would like to turn some large wooden bowls from 8 to 16 inches diameter, and some cheese molds about 6 inches high, and from 6 to 12 inches diameter. What is the best wood for that purpose? Shall I work it green or dry? If worked green, how shall I treat it to keep it from splitting? What is the best way to hold the pieces to the lathe mandrel? Is it profitable to turn a number of the cheese molds on one piece first, before hollowing them out? Are there tools that will cut in this way several bowls out of one piece concentrically, or does that not pay? Which are the best tools for cutting them out?

15.—A. H. says: At the back of my house is a brook, which for many rods passes over a gravelly bed; and in some seasons of the year it dries up. During the night time and on very cloudy days, there may be quite a stream of water; but when the sun appears, the water disappears; and, again when the sun disappears, the water comes again. There are several theories about it, but what are the facts or true cause? 2. A small cast iron common pump was so arranged that by elevating the piston to its highest point it admitted air and allowed the water to settle down. The end of the handle, or lever, rested on a board of the well curb. On a very cold morning the lever was found broken between its fulcrum and the piston rod, near the former, leaving a piece of about a foot long and of some four or five pounds weight attached to the piston rod, but thrown entirely over it and hanging on the opposite side from that on which it would naturally have fallen. It is easy to understand how the pump could have become frozen up, and how a sound bar of iron, one inch by one and one half inches, could be broken; but how that weight of iron could be raised and thrown over, is a question. The board of the curb could have nothing to do with it, and it does not seem possible that the ice and frost in the pump barrel could affect it in that manner. The elasticity of the cast iron seems to have caused it; but will some one who can, kindly furnish a solution?

Answers to Correspondents

R. A. R. asks us to inform him why the holding a darning needle in the mouth while peeling onions will prevent the onions from affecting the eyes. Answer: It won't do it.

J. E. G. sends two mineral specimens and asks what they are. Answer: The specimens are red jasper, a stone which takes a fine polish and is used in mosaic work, but is not counted among the "precious" stones.

M. B. sends a specimen, which melts readily with little loss, and it is suggested that it may be tin. Answer: It is a chloride of lead with a small percentage of copper, a mineral of rare occurrence in the United States.

T. H. C. asks: What are the ingredients and proportions of Babbitt's metal? Answer: To make Babbitt's metal, melt 4 lbs. copper, add by degrees 12 lbs. best tin, 8 lbs. regulus of antimony and then 12 lbs. more tin. After the last four or five pounds of tin have been added, reduce the heat to a dull red and then add the remainder of the tin.

G. E. H. says: Please inform me of a process to take the impressions of tree and plant leaves, if possible in some chemical manner, to retain their color in the impression, which is to be preserved in book form for future reference. Answer: Impressions can be very neatly taken, in many cases, by means of the impression paper which is sold by the stationers. In some instances, we have seen photography used to obtain permanent representations of leaves. We know no means by which colors can be either transferred or automatically reproduced.

E. N. says: I have heard it stated that one square foot of heating surface in a fire box of a boiler was equal to five square feet of flue or tube surface for steam purposes. What difference is generally allowed in practice; and what difference, if any, is there between vertical and horizontal tubes for steam purposes? Answer: The estimates of the power of a steam boiler are usually based upon the total area of heating surface. As a rule, the best fire-tubular boilers have about 30 square feet of heating surface to the square foot of grate, and water tube boilers are given nearly a proportion of 35 to 1.

D. M. A. asks: What causes foaming in an engine boiler? Is it dangerous or apt to cause an explosion of boiler? Does steam ever descend under the water in a boiler and force the water up and then take its place? Answer: Foaming is caused by the generation of steam more rapidly than it can disengage itself from the mass of water within which it is formed. It may give rise to inconvenience, and even danger, either by carrying water out of the boiler more rapidly than the feed pump can replace it, or by entering the steam cylinder of the engine and creating a liability to accident, when the piston strikes upon it, at the end of its stroke, by breaking crank pin, connecting rod or cylinder head. Steam does not get under the water but is sometimes so rapidly disengaged, at points on the heating surface under water, as to almost or quite displace the water.

J. H. L. asks: Will you please inform me (1) how much coal a large ocean steamship consumes in 24 hours when under full steam; and (2) how much is usually consumed in a trip from Liverpool to New York and *vice versa*? 3. Also state the total tunnage of an ocean steamer including fuel. 4. Also give me the tunnage of the Great Eastern, and what coal she consumes in 24 hours under full steam. 5. Is steam used all the time in making the trip, or is sail used part of the time alone, or are both steam and sail are used together? Answers: An ocean steamer frequently burns from 75 to 100 tuns of coal in 24 hours. There are vessels in the British Navy which, under full power, will burn about 300 tuns in 24 hours. 2. Probably an average of 1000 tuns for the whole run. 3. From 2,500 to 3,500 tuns registered and up to 4,500 tuns displacement. 4. The Great Eastern has a registered tunnage of 18 000 and an actual displacement when down to her maximum draft, of 26,000 tuns. We are not certain what amount of coal she now uses. It was formerly not far from 15 tuns an hour. 5. We do not think that she is ever under sail alone.

R. L. asks: 1. Can you supply me with any information respecting the application of compressed air, as a motor for manufacturing purposes? In other words: Suppose I have a water power within half or quarter of a mile of a navigable stream where I have saw logs that I desire to cut up, and that it is costly and inconvenient to take the logs from this stream to the waterfall, and the same to conduct the water to the logs; would it be practicable or economical to use the power of the fall to compress air, and convey it by pipe to the river where my logs are? What is the best sort of pump or cylinder for compressing air, and what diameter of tube would be required, taking the relation of distance and horse power into account? What kind of engine would be needed? What amount of power would be lost by friction, in using the compressed air in lieu of the water? 2. Suppose my waterfall admits an overshot wheel of 24 feet diameter, will I gain power by putting up two wheels of 12 feet diameter each, one above the other, and using the water twice, than if I use the water only once on my 24 feet wheel? Or again, will two horses of equal strength draw a greater weight, by attaching each one to a wagon with wheels of only three feet in diameter, than one of these horses will if attached to a wagon that has wheels six feet in diameter? Answers: 1. We should anticipate greater expense both in first cost and in maintenance by the plan proposed than by the adoption of the "telo-dynamic" method of transmission which our readers have seen described in the back numbers of the Scientific American. A light line of wire rope, travelling at high speed over pulleys of large diameter, will give a better effect, in such cases, than will any other means of transmission of power to great distances. Find a well informed mechanical engineer and obtain plans of details from him. 2. We should use the larger wheel under such a fall, if we were compelled to use an overshot rather than a good turbine wheel. 3. The experiments of Mr. Joseph Coe, at Seaconnet, R. I., have shown a large gain by the use of wheels six feet diameter, approximating that indicated by the laws of friction, but not, we think, to the degree indicated by the question, to which we reply: The larger wheels are, necessarily, of themselves, so heavy as to make an important addition to the resistance. Under theoretical conditions of merely rolling friction, we should reply to this question in the negative. Wheels should always be as large as practicable.

G. S. N. asks: In using a light lubricating oil, made from petroleum, to remove the scale in steam boilers, would there be any danger of the gas, that would arise from the heated oil, exploding? We have two tubular boilers in our mill, and they are badly incrusted with lime. We saw recommended in your paper the use of crude petroleum for removing scale in boilers. We put in our boilers two gallons of lubricating oil made from petroleum, and there was such a gas and smoke made from the burnt oil that we were afraid the gas would ignite and explode the boilers. If there is no danger, we would like to continue the use of the oil, for we think it is doing more good than all the anti-incrustants we have used before. Answer: No explosion can occur where the vapor is unmixed with the proper proportion of air or oxygen. There is no danger except from vapor escaping into the boiler or engine room, and we should presume that such escape would not be likely to occur to a hazardous extent. The boilers themselves are not in the slightest danger.

J. L. B. asks: Why will not a glass fruit jar break if allowed to rest its bottom on a wet cloth when hot liquids are poured into the jar? The wet cloth should be a few times folded, and the cloth may be wet with cold water. The fruit or liquids may be boiling hot; not one jar in fifty will break, and the operation does not seem to require care. This plan of putting up fruit in jars is now altogether practiced by those who know the fact, and it saves the trouble of heating the jars; and with even this precaution a larger percentage will be broken than by the other unexplained or phenomenal process. Answer: The statement of our correspondent is interesting and will probably afford a valuable piece of housekeeping information to our readers. We presume that Professor Tyndall will be able to give us the information asked, when he reads the request in our columns. We should prefer to make an experimental investigation of the subject before presenting our own opinion.

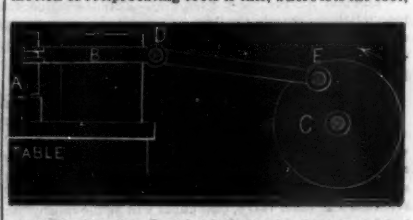
A. S. asks: How does a railway train turn a sharp curve, where the outer rail is considerably longer than the inner, all the wheels being of the same diameter and keyed to axle? And J.H. asks: How the outside wheel of a locomotive or car (on a curve) keeps pace with the inside wheel, on account of the distance to travel being greater, both wheels being fast on the axle? Answers: With wheels of equal size and having cylindrical bearing surfaces, one or both must slip on the rail. The wheels of the cars on railroads are "coned" to avoid this difficulty, their diameter on the outer edge of their bearing or "tread" being less than that of the portion of the tread next the flange. In turning a curve, the wheels ride toward the outer rail, and thus, to some extent, if not wholly, this tendency to slip is prevented.

R. D. and others who ask for information on the setting of slide valves and position of eccentrics are referred to pages 123, 234, 250 of volume XXVII.

C. J. McC. asks for directions for dissolving horn, which he will find on page 91 of our current volume.

J. J. O'F. asks: What would be the cost per spindle (say for 100 spindles) for all the machinery (power excepted) necessary to manufacture cotton yarn out of lint cotton? Answer: From $8.50 to $10.50 per spindle according to quality and number of spindles, power and buildings not included.

W. F. C. S. asks: 1. Suppose a builder of engines has a contract to build an engine for a certain sized machine shop or manufactory; how does he ascertain the size of the engine that will do the work? Suppose there were 20 lathes, 3 planers, 2 drills, a line of shafting, counter shafts, etc.: how is the number of horse power required to do the work found? What rule applies to all sized shops? 2. How is the device constructed that produces the fast and slow motion on a compound planer, slow while the tool is cutting and fast while it is returning? 3. I have seen in books on philosophy that a bar, balanced at the middle point, would balance in any direction. I have not been able to do so on a pair of druggist's scales. Why is such a thing stated when it cannot be practically demonstrated? Answers: 1. There can be no general rule for determining power required to drive machine shops. The kinds of machinery and character of the work are so variable that it requires the exercise of experienced judgment in each case. An experienced engine builder should be able to tell at once, upon inspection, what power he must calculate for. 2. The simplest device for the fast and slow motion of reciprocating tools is this, where A is the tool,



carried by the piece B which is driven by the wheel C by means of the link D E. The center, C, is below the level of D. As the driving wheel turns, it throws the tool forward at the proper cutting speed and draws it back more rapidly in proportion as the wheel C is larger and D E shorter. Another is that of elliptical gearing, but it is expensive. 3. The proposition that a bar balanced in the horizontal position will balance in any other is not true except when it is supported exactly at its center of gravity. Bodies of any shape, supported at their centers of gravity, will remain at rest in any position. Take a perfectly straight bar and draw a line through the middle of the two sides and either cut a notch up to the line or drive a pin through, so that the bar may be supported at the middle of the line, *exactly*; the bar will then be in equilibrium in any position. Scales are purposely made with the centers of gravity *below* the points of suspension, so that they may return to the horizontal when unloaded.

W. A. G. says: In the packing room of a dry goods store, the goods coming from the saleroom are lowered by means of a Beekman rotary engine (300 revolutions per minute) which is supplied with steam from a boiler distant 100 feet diagonally across the packing room; the steam pipe running immediately under the ceiling. This pipe seems to conduct the sound of the engine in such a manner that the entry clerks cannot hear the caller off, on account of the noise. What coating or covering will prevent the conducting and radiation of this sound in the packing room? Answer: The steam pipe should be covered to prevent loss of heat and consequent waste in using wet steam, as well as to prevent the annoyance referred to. Try making two or three joints in the length of the pipe, or at boiler and engine, with flanges and thick gum packing. For small pipes, covering with felting and canvas is usual.

E. S. B. asks: 1. What are the relative merits of the locomotive and the horizontal stationary boilers? 2. What is the best plan for taking the sap from green wood so that it may be worked immediately? Is it to be boiled or steamed, and how long would it take for a block four inches square and twelve in length? Answers: 1. The locomotive form of boiler is compact, powerful, and, when properly proportioned to its work, very economical. It is more costly than simpler forms of boiler and, in consequence of the difficulty of removing scale from its tubes, cannot be used when the feed water is liable to produce incrustation. The plain cylinder boiler is of least first cost and easiest to free from scale, but is the least economical in the use of fuel. Other forms of boiler, intermediate between these, usually share their advantages and defects as they more or less resemble the one or the other. Some of the "sectional" boilers have special advantages over either of the above named, in addition to their greater safety. 2. Boil four hours, then dry slowly at a temperature not exceeding 200° Fahr.

E. J. L. asks: Will you give me a rule for calculating the pressure on steam boilers, by the lever and weight? I have searched several works on the steam engine, but have not found two rules alike for calculating the pressure on boilers. Answer: E. J. L. will find his question already answered in our reply to an earlier and similar request.

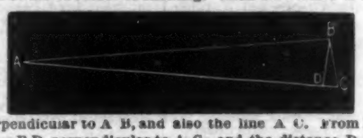
A. S. asks: 1. Where is the point of suspension in the arms of a regulator? Is it the center of pin where the arms are suspended or where the line of the arms would cross in the center? 2. How can I find out the horse power of a boiler of a given size, say 14 feet long and 5 feet diameter? Answer: 1. The hight of regulator for use in estimating the time of revolution is measured from the plane in which the balls are to revolve

up to the point where the arms, if extended, would cross the center line of the standard. 3. Measure the heating surface and divide by 25, and the result will give the number of cubic feet of water which any fairly designed and well set boiler should evaporate per hour. A good engine uses about half a cubic foot per horse power per hour.

F. D. R. says that P. L., who asked for a good book on pyrotechny, will find Mortimer's work on pyrotechny as good as any.

W. D. O. says: Suppose a man to be suspended from the sun to within speaking distance of the earth. The attraction of gravitation draws him constantly toward the earth's center; he remains stationary and the earth revolves beneath him once in twenty-four hours. This noon when I come under him he asks me the time of day, and I say "twelve o'clock, noon, Friday, January 24;" I pass along and he asks others the time of day, and they, being under the sun, of course say just the same. Where is the man to tell him it is twelve o'clock on Saturday? Even suppose I was the first who told him it was noon Friday, ought I not to be the first to tell him it is noon Saturday? But five minutes before I come along, a man will tell him it is twelve, noon, Friday, and our stories will not agree, yet both tell the truth. Answer: Possibly the suspended individual might have an opinion of his own, and believe it to be Sunday all the time. We should advise our correspondent to wait until the case actually occurs before giving valuable time to so profitless a discussion, which, however, may be promptly closed by reminding those who take part in it that our ideas of time are relative, having no absolute natural standard by which to fix the limits.

F. E. D. asks: How can I find the different diameters of two cones in order to get the required speeds and an equal tension of belt? For instance, I have counter shaft making 130 revolutions per minute, and want my machine to run 67, 100, and 133. The largest size of the driving cone is to be 12 inches, and the distance between centers of cones to be 7 feet. What will be the proper diameters to make the steps of the two cones to have the speeds mathematically correct and also to keep the belt equally tight on the different speeds. Answer: For crossed belts, vary the sizes uniformly so that the sum of the diameters of the several pairs on which the belt at any time runs shall be the same for each step. For open belts, the cones must be enlarged at the middle by an amount which can be determined thus: Draw the line A B, equal to the circumference of a circle whose diameter is the distance between the centers of the two lines of shafting. Then draw a line B C,

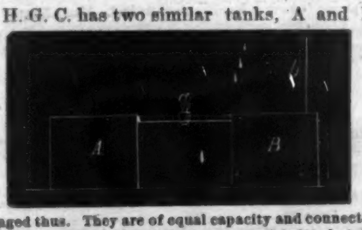


perpendicular to A B, and also the line A C. From B draw B D, perpendicular to A C; and the distance D C measures the amount by which the middle pair must be enlarged in their radii. Those on either side the middle pair must be of proportionally increased radius.

T. J. asks: Is there more than one kind of check valve in use? If so, how many? Answer: The plain check valve is so made as to rise and allow the water to pass through it in one direction, but closes at once when the current sets backward, preventing its return. The screw check valve has a stem fitted with a screw and a handle, which, when lifted to the proper hight, allows the valve to act as a check valve, but which may be screwed down, holding the valve in its seat. It then acts as a stop valve. Different makers have different styles of these two classes of valves.

J. S. L. says: Last winter I dug a well and put in an iron submerged pump, leaving, in the stone that covers the well, a hole only large enough for the pipe to work in, say a 1¼ inch hole for a ⅝ pipe. From six inches below the rock, I began laying the wall in water lime and continued it to the top; this I did to keep out the worms. Last fall the water from this well got to smelling badly. I removed the covering stone. After pumping it dry, I made it as clean as I could, finding but one fish worm. I had frequently pumped them up before. Within a few days past it has got to smelling worse than before. What I want to ask is, whether the covering the well as tight as it is would make the water impure? Since I cleaned it out until a few days past, it has been very pure, with no smell whatever. About three rods from the well is a privy with a sink, but the stream that supplies the well comes from the opposite direction, that is, the opposite side of the well from the privy. Please tell me of something that will purify it. Answer: Free access of air may keep the water sweet, by causing the oxidation of impurities and thus preventing their decay from surcharging the water with unwholesome matter. If entirely closed at the top, the well would soon become unwholesome, if any organic matter were to find its way into it, by the putrefaction of such matter, whether animal or vegetable. Thorough cleansing and a free use of its water, in order that none be allowed to remain long enough to become foul, are the best preventives of trouble. We should feel very apprehensive in regard to using water from a well situated as is the one described. Typhoid fever and diseases of that nature are generally ascribed to the use of water or to the breathing of air contaminated with matter arising from animal *excreta*.

H. G. C. has two similar tanks, A and B,



ranged thus. They are of equal capacity and connected by a pipe *a* having a cock as shown. In B is fitted a tube *b*, rising to the hight of a column of water which exerts the pressure of one atmosphere at its base, that is, somewhat above 30 feet. B is filled with water which is forced out through *b*, by means of air pressure obtained by driving air into A, the cock, *a*, being open. The question is "How many volumes of air must be forced in?" Answer: A containing air, and B being full of water, there is one volume already present, at a pressure of one atmosphere. To force the last portion of water from B, it will be necessary to have, at that moment, both vessels filled with air at two atmospheres pressure, *measuring in each case from a perfect vacuum line*. Thus there are now present four volumes, of which one was present originally. Three have therefore been forced in.

"Engineer" and some other correspondents have sent us repetitions of the stale question about the man going round a tree on which there is a squirrel. The subject was discussed in our paper some time ago, and we decline to renew it.

G. P. says: I have a house which has been struck with lightning once before I had rods put up, and taking the house as a center, it has struck within a radius of twenty rods, nine times or more within the last twenty years. The position does not seem to be peculiarly exposed. I have stated a fact, and believe science should find a satisfactory explanation. Answer: Lightning always takes a path, when passing between the cloud and the earth, which offers least resistance. In the case mentioned, the point struck may be somewhat higher than the surrounding localities, or its soil may be more moist, or the presence of subterranean springs or mineral veins may offer unusually good routes of travel to the electricity.

F. D. R. says that G. S., who asked for a cement for lamp chimneys, can prepare it by heating common plaster of Paris to 300° Fahr.

D. P. D. says that W. & Co., who asked how to make a paste that will adhere to bright tin, should apply common flour paste in which about one table spoonful of brown sugar to a quart of paste is mixed.

J. S. says in answer to G. W. D., who asked if it would take less power to draw a weight by a long rope than a short one: I imagine that G. W. D. has not put the question properly to elicit the desired information. If a horse is hitched close to the load and his traces are low down, he will draw a larger load than if he were farther off. It gives him more traction and lessens the friction, as he partly lifts the load. If his traces were hitched high up on the load he would lose his traction and create more friction by pulling down, and would pull more if he were farther off. Your answer is, I believe, correct in regard to the use of mechanical power in the manner described.

J. G. D. says that H. L. B., who asks how to remove paint, etc., should take caustic soda or concentrated lye dampen or dissolve, and apply.

A reader says: In answer to the article "A Novel Problem," in your issue of February 8, 1873, I would say that the creeping of the rails was caused as follows: The centrifugal force of the end of the train nearer the south being greater than that of the northern end (caused by the revolution of the earth), the northern end of the train would act most on the track, which in a train moving south would tend to draw the track after it, and in moving north to pull the track towards it; and the revolution of the earth being from west to east, the pressure of a train would be the greatest on the western rail, thereby exerting the greatest influence, as above, on that rail.

A. H. says, in answer to C. H. B., who asked for a method of tinning cast iron: I used to tin boxes by heating them, then using a flux of alcohol or salt of ammonia, and tinning with a common soldering tool or a copper wire swab, with melted solder. They were cast iron boxes for steam engines and other purposes.

A. F. C. says, in reply to H. W., who asked what caused the heating of his journals: Examine your journal, and you will find an uneven place which cuts the boxing and gives too much play. Try with a pair of calipers or a hole bored in a plank.

W. H. T. says: The answer to E. E.'s query, how to form a perfect cube in perspective, is not correct. It would be an excellent isometrical cube, but a very poor perspective cube, the horizontal parallel sides of which must tend to a point on the horizontal line, at a distance from the center of view proportioned to the situation from which the cube is viewed; while the parallel sides of an isometrical cube, extended, would be parallel *ad infinitum*.

F. D. R. says, in reply to G. W. H. who asked how to make "Alaska scenery:" Dissolve 456 grains of nitrate of lead in six fluid ounces of water; if the solution is turbid, filter it. Place the solution where it is intended that it shall remain, and drop into it 200 grains of sal ammoniac, in long fibrous crystals. The result is "Alaska scenery."

J. G. D. replies to S. J. H., who asked why a top does not fall when spinning, that the centrifugal force overcomes the attraction of gravitation.

E. D. says in reply to C. H. B., who asked how to tin cast iron: A process for tinning common cast iron is one of the things that is yet to be found out. Any person having a process to tin gray iron and to give it a finish equal to what is known to the trade as C plate or even to give it a smooth coat of tin, would have too good a thing to let lie round loose.

H. M. W. replies to J. B. B. who asks what composition will make cloth waterproof, without altering its appearance: Into a half bucket of soft water put half a pound of sugar of lead. In another half bucket of water, put half a pound alum. Stir till dissolved and then mix the two solutions together. Stir well, let stand till clear and pour of. Put the garments in the liquid for 24 hours, take out and hang up to dry without wringing. Acetate of alumina is here the water-repelling salt.

W. A. C. says, in reply to C., who asked how to case harden part of an object: Labor expended in case hardening the face of a hammer would be thrown away. To harden the face of a steel hammer, I heat the face only at a slow red heat. Then I place it under a stream of water so that only the face will be wetted. When the face is cool enough, I polish it a little, and the heat left in it will draw the temper to the required color.

W. H. B. sends a mineral specimen, and asks what it is. Answer: The sample loooks like decomposed mica schist, it is probably of no value.

J. R. asks for a process of separating lead from tin. Answer: If the lead and tin are in solution precipitate the former by sulphuric acid and the latter with sulphuretted hydrogen gas. In an alloy the lead will dissolve in nitric acid, leaving the tin as an oxide.

COMMUNICATIONS RECEIVED.

The Editor of the SCIENTIFIC AMERICAN acknowledges, with much pleasure, the receipt of original papers and contributions upon the following subjects:

On the Bursting of Cylindrical Boilers. By R. C.

On Perpetual Motion. By B.

On the Creeping Rail Problem. By J. S.

On the Ignition of Wood by Steam Pipes. By M. M.

On Fires, their Prevention and Means of Saving Life. By W. M. B.

On Central Forces. By T. W. B.

On the Occurrence of Fires from Superheated Steam. By J. A. M.

[OFFICIAL.]

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FOR WHICH

Letters Patent of the United States

WERE GRANTED FOR THE WEEK ENDING

January 21, 1873,

AND EACH BEARING THAT DATE.

[Those marked (r) are reissued patents.]

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APPLICATIONS FOR EXTENSIONS.

Applications have been duly filed, and are now pending for the extension of the following Letters Patent. Hearings upon the respective applications are appointed for the days hereinafter mentioned:

22,528.—WEBBING.—J. C. Cooke. April 9.
23,770.—COLLARS AND CUFFS.—W. E. Lockwood. April 9.
23,795.—PUMP BOX.—F. and J. Stock. April 9.
23,810.—TIME REGULATOR.—R. S. Mershon. April 9.
23,862.—ROOFING CEMENT.—N. A. Dyar. April 9.
23,970.—STOVE.—J. G. Widmann. April 23.
24,046.—ROLLING MACHINE.—T. H. Murphy. April 30.

EXTENSIONS GRANTED.

22,742.—BED BOTTOM.—B. F. S. Monroe.
22,756.—MANY BARRELED FIRE ARM.—C. Sharps.
22,757.—STOVE.—P. Dodge.
22,798.—MANUFACTURING WOODEN TROUGHS.—S. T. Field
22,841.—SADDLE TREE.—S. E. Tompkins *et al.*
22,803.—MILL FOR GRINDING CANE, ETC.—I. A. Hedges.

DESIGNS PATENTED.

6,242.—WOOD TYPE.—J. F. Blackman, Brooklyn, N. Y.
6,243 to 6,247.—OIL CLOTHS.—J. Hutchison, Newark, N. J.
6,248.—LAMP POST.—P. H. Jackson, New York city.
6,249 & 6,250.—OIL CLOTH.—H. Kagy, Philadelphia, Pa.
,251.—PRINTING TYPE.—R. Smith, Philadelphia, Pa.

6,352 & 6,353.—CARPETS.—B. Crabtree, Jr., Philadelphia.
6,354.—CARPETS.—J. Dornan, Philadelphia, Pa.
6,355 & 6,356.—CARPETS.—A. Heald, Philadelphia, Pa.
6,357.—CARPETS.—W. J. Hogg, Philadelphia, Pa.
6,358.—CARPETS.—H. S. Kerr, Philadelphia, Pa.
6,359.—PRINTING TYPE.—A. Little, New York city.
6,360.—CARPETS.—J. Powell, Kidderminster, England.
6,361.—CARPETS.—C. Righter, Philadelphia, Pa.
6,362.—HINGES.—J. B. Whitney, New York city.
6,363 & 6,364.—KNOBS.—J. B. Whitney, New York city.
6,365.—ESCUTCHEONS.—J. B. Whitney, New York city.
5,366, & 6,367.—SODA APPARATUS.—G. F. Meacham, Newton, Mass.

TRADE MARKS REGISTERED.

1,100.—SQUIBS, ETC.—S. H. Daddow, St. Clair, Pa.
1,101.—UMBRELLAS.—Dawes & Fanning, New York city.
1,105.—CIGARS.—F. De Bary & Co., New York city.
1,106.—PRINTING PRESS.—J. C. Tripp, Fairhaven, Mass.

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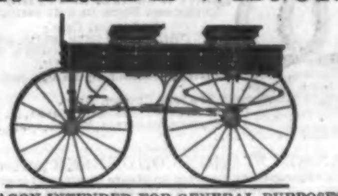

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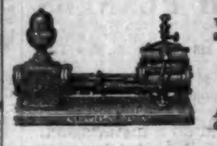

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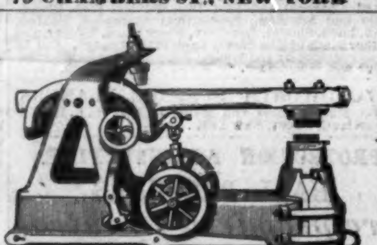

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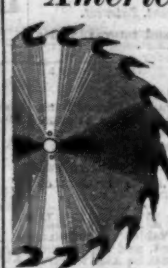

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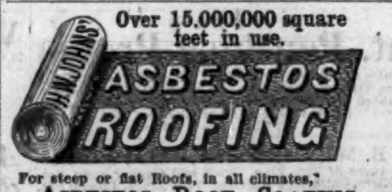

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